Performance and Pressure Data from a Small Model Tilt-Rotor in Hover

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National Aeronautics and
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Summary

A test of a small three-bladed model rotor, with geometry typical of that used on tilt-rotor aircraft, was conducted in the U.S. Army Aeroflightdynamics Directorate's anechoic hover chamber. The objectives of the test were to determine the hover performance of the rotor and investigate the pressure distributions on a blade operating at various collective pitch angles and tip speeds. This report presents the rotor performance data and blade surface pressures.

Nomenclature

c	rotor chord length, in.
C_P	blade surface pressure coefficient, $(p - p_\infty)/0.5\rho(\Omega r)^2$
C_Q	rotor torque coefficient, $Q/\rho(\Omega R)^2(\pi R^3)$
C_T	rotor thrust coefficient, $T/\rho(\Omega R)^2(\pi R^2)$
FM	rotor figure of merit, $(C_T)^{1.5}/C_Q\sqrt{2}$
l	airfoil lower surface
P	blade surface pressure, lb/ft^2
P_∞	ambient pressure, lb/ft^2
Q	rotor torque, ft·lb
r	blade radial station, ft
R	rotor radius, 2 ft
rpm	rotor rotation speed, rev/min
t/c	maximum thickness to chord ratio
T	rotor thrust, lb
u	airfoil upper surface
x	chordwise distance from leading edge, in.
y	coordinate normal to blade chord, in.
β	blade twist relative to 0.75R, deg
θ_c	collective angle at 0.75R, deg
ρ	air density, slugs/ft^3
σ	thrust-weighted solidity, 0.1194
Ω	rotor rotational speed, rad/sec

Introduction

The accurate prediction of hover performance is particularly important for tilt-rotor aircraft since the payload represents about thirty percent of the aircraft's gross weight. NASA Ames Research Center has recently conducted a series of tests to measure tilt-rotor hover performance and wake geometry at various test conditions (refs. 1 and 2). Reference 3 reported the correlation of these test results with predictions using a rotorcraft analysis program, CAMRAD. They found that the theory underpredicted the XV-15 ATB (advanced technology blade) rotor hover figure of merit at high thrust coefficients ($C_T/\sigma > 0.14$). In addition, the measured figure of merit remained a high level at high thrust coefficients while the predicted value dropped off.

The purpose of this test was to obtain a blade surface pressure and performance data set which could be used to investigate the reason for the discrepancy between the measured and predicted performance of highly twisted rotors. This report presents the performance and pressure data obtained from this test but does not attempt to draw any conclusions. However, the reader may consult a paper by Tung and Branum (ref. 4), which speculates on the cause of the underprediction of the high thrust theoretical figure of merit.

Description

Rotor

The rotor tested is a small three-bladed rotor designed to operate at thrust coefficients typical of current tilt-rotor aircraft but does not represent any particular full scale configuration. The rotor was mounted on the Aeroflight-dynamics Directorate's rotary wing test stand in the Army hover chamber as shown in figure 1. The rotor system has a diameter of 4 feet and a thrust-weighted solidity of 0.1194. The blades are constructed of birch wood and have a total twist of 32° between the root cutout and the tip. The blade thickness tapers nonlinearly from the root to the tip. Given in table 1 are the twist, chord, and maximum thickness distributions of the blade as a function of radius. The blade section airfoils were originally intended to represent NACA 64 series airfoils, but templates made of 12 radial locations along the hand crafted blade showed that the actual airfoil sections differed from that series. These templates were digitized so that the actual airfoil geometry could be determined for subsequent analysis. The actual airfoil coordinates are included in appendix A. To obtain surface pressure data for this test, one of the blades was configured with nineteen 0.03 inch diameter pressure tubes. Ten of these tubes were embedded radially along the upper surface of the blade while the remaining tubes were embedded radially along the lower surface. Tap orifices were located at eight radial locations on each pressure tube. Table 2 shows the tap location for both the chordwise and radial directions. Figure 2 shows a partial view of the pressure orifices on the upper surface of the blade.

Instrumentation

Each of the nineteen pressure tubes in the blade was connected to a Kulite (YQC-250 series) differential pressure transducer using flexible plastic tubing. These pressure transducers were located inside a container above the rotor hub (fig. 2). As shown in the figure the transducers were set close to the center of rotation, 1.5 inches, and aligned vertically so that effects on the pressure measurements, caused by the centrifugal force acting on the transducer diaphragms, would be reduced as much as possible. Calibration checks of each transducer were performed on a daily basis prior to operating the rotor. This was accomplished by comparing each transducer's measured pressure to a known pressure applied at each tap orifice using a Paroscientific pressure calibrator. Thrust and torque data were obtained from the rotor using a six component strain gage balance. Other measurements included ambient temperature and pressure and rotor rpm.

To avoid being influenced by the rotor wake, the ambient pressure sensor was located directly outside of the testing chamber. Pressure data from the rotating system were transmitted to the nonrotating system using a 156 channel Polyscientific slipring. From that point, both pressure and balance data were passed through Pacific differential amplifiers and filtered to 10 Hz. All data were then recorded using an HP 3852A data acquisition system.

Test Conditions and Procedures

Performance and pressure data were obtained at collective pitch angles ranging from 0° to 28° and rotor speeds of 400, 600, 800, 1200, 1800, and 2400 rpm. Table 3 lists the collective angles and rotor speeds tested. The collective pitch angles were manually set at the hub for each blade using a template at the 3/4 radius and a digital protractor. Pressure data were collected at one radial location at a time since each pressure tube had eight radial tap orifices per transducer. This was accomplished by sealing off seven radial locations using strips of two inch wide cellophane tape wrapped chordwise around the blade, thereby leaving just the one remaining radial location open for data measurement. Once data were obtained for that particular collective setting and radial location, another radial location was opened and the previous one sealed off. This was done until data at all eight radial locations were recorded for a range of rpm's. The collective angle was then changed and the process repeated. A check for vacuum leaks was performed each time a new radial location was sealed by using a Paroscientific pressure calibrator.

Test Results

Hover Performance Data

The tip speed of 377 ft/sec at 1800 rpm corresponds to a tip Reynolds number of about 500,000. Figure 3 shows the effect of collective pitch angle on CT/σ at 1800 rpm. The solid line indicates two different rates of increasing CT/σ with respect to the collective pitch angles. The CQ/σ as a function of collective pitch angle is given in figure 4. The solid line in this figure represents a third-order polynomial least-squares curve fit of the data. The CQ/σ versus $(CT/\sigma)^{1.5}$ curve is shown in figure 5. A linear relation is observed for $(CT/\sigma)^{1.5}$ up to 0.087 with a second linear relationship being seen above that value. The figure of merit for this rotor is shown in figure 6 as a function of CT/σ. The figure of merit reaches a plateau at 0.75 between CT/σ equal to 0.1 and 0.17 and drops off quickly as the CT/σ is increased above that level.

Pressure Data

The column of air inside the pressure tube is subjected to centrifugal force, so the measured pressure coefficients need to be corrected for this effect. This correction was applied during data reduction. The flexible tubing between the pressure tube at the 85 percent chord location on the upper surface of the blade and its transducer was not functional during the early part of the test but was repaired later in the test. Because of this, some of the figures and data tables do not contain pressure information for that location. In addition, pressure data from the 60 percent chord location on the lower surface of the blade were not obtained due to an inoperable transducer. Typical sectional pressure distributions are shown in figure 7 for all collective angles tested at 1800 rpm. Figures 8(a) and 8(b) are plots of C_P distributions over a range of collective angles at $r/R = 0.2$ and $r/R = 0.75$, respectively. The surface pressure distributions over a range of rotor speeds are shown in figures 9(a) and 9(b), respectively. From observation, the pressure coefficients do not change very much with the rotor speed. All pressure and performance data can be found in appendix B. Data are organized in order of increasing collective angles. Multiple asterisks in the data set represent data which were not available due to problems with that particular transducer.

References

1. Felker, F. F.; Young, L. A.; and Signor, D. B.: Performance and Loads Data from a Hover Test of a Full-Scale Advanced Technology XV-15 Rotor. NASA TM-86854, Jan. 1986.

2. Felker, F. F.; Young, L. A.; Signor, D. B.; and Betzina, M. D.: Performance and Loads Data from a Hover Test of a 0.658-Scale V-22 Rotor and Wing. NASA TM-89419, Apr. 1987.

3. Felker, F. F.; Maisel, M. D.; and Betzina, M. D.: Full Scale Tilt Rotor Hover Performance. J. Am. Helicopter Soc., vol. 31, no. 2, Apr. 1986.

4. Tung, C.; and Branum, L.: Model Tilt-Rotor Hover Performance and Surface Pressure Measurement. Presented at the 46th Annual Forum of the American Helicopter Society, May 1990.

Table 1. Blade characteristics

r/R	ß, deg	c, in	t/c
0.155	26.70	4.09	0.466
0.206	23.20	4.05	0.407
0.306	17.80	4.02	0.335
0.405	11.10	3.90	0.269
0.506	8.20	3.77	0.211
0.606	3.80	3.60	0.191
0.707	2.20	3.39	0.162
0.756	0.00	3.25	0.147
0.805	-0.80	3.09	0.138
0.856	-2.60	2.95	0.125
0.906	-3.90	2.78	0.120
0.959	-4.60	2.54	0.107

Table 2. Tap locations for the upper (U) and lower (L) surfaces of the pressure blade

%c / %R	6.0	10.0	15.0	25.0	30.0	35.0	40.0	45.0	50.0
12.5	U	L	U,L	U	L	U	L	U	L
20.0	U	L	U,L	U	L	U	L	U	L
30.0	U	L	U,L	U	L	U	L	U	L
40.0	U	L	U,L	U	L	U	L	U	L
50.0	U	L	U,L	U	L	U	L	U	L
60.0	U	L	U,L	U	L	U	L	U	L
70.0	U	L	U,L	U	L	U	L	U	L
75.0	U	L	U,L	U	L	U	L	U	L

%c / %R	55.0	60.0	65.0	70.0	75.0	80.0	85.0	90.0	95.0
12.5	U	L	U	L	U	L	U	L	U
20.0	U	L	U	L	U	L	U	L	U
30.0	U	L	U	L	U	L	U	L	U
40.0	U	L	U	L	U	L	U	L	U
50.0	U	L	U	L	U	L	U	L	U
60.0	U	L	U	L	U	L	U	L	U
70.0	U	L	U	L	U	L	U	L	U
75.0	U	L	U	L	U	L	U	L	U

Table 3. Summary of test conditions

θ_c / rpm	0	4	8	12	16	18	20	22	25	26	27	28
400	•	•	•		•		•		•	•	•	•
600	•	•	•		•		•		•	•	•	•
800	•	•	•		•		•		•	•	•	•
1200	•	•	•	•	•	•	•	•	•	•	•	•
1800	•	•	•	•	•	•	•	•	•	•	•	•
2400	•	•	•									
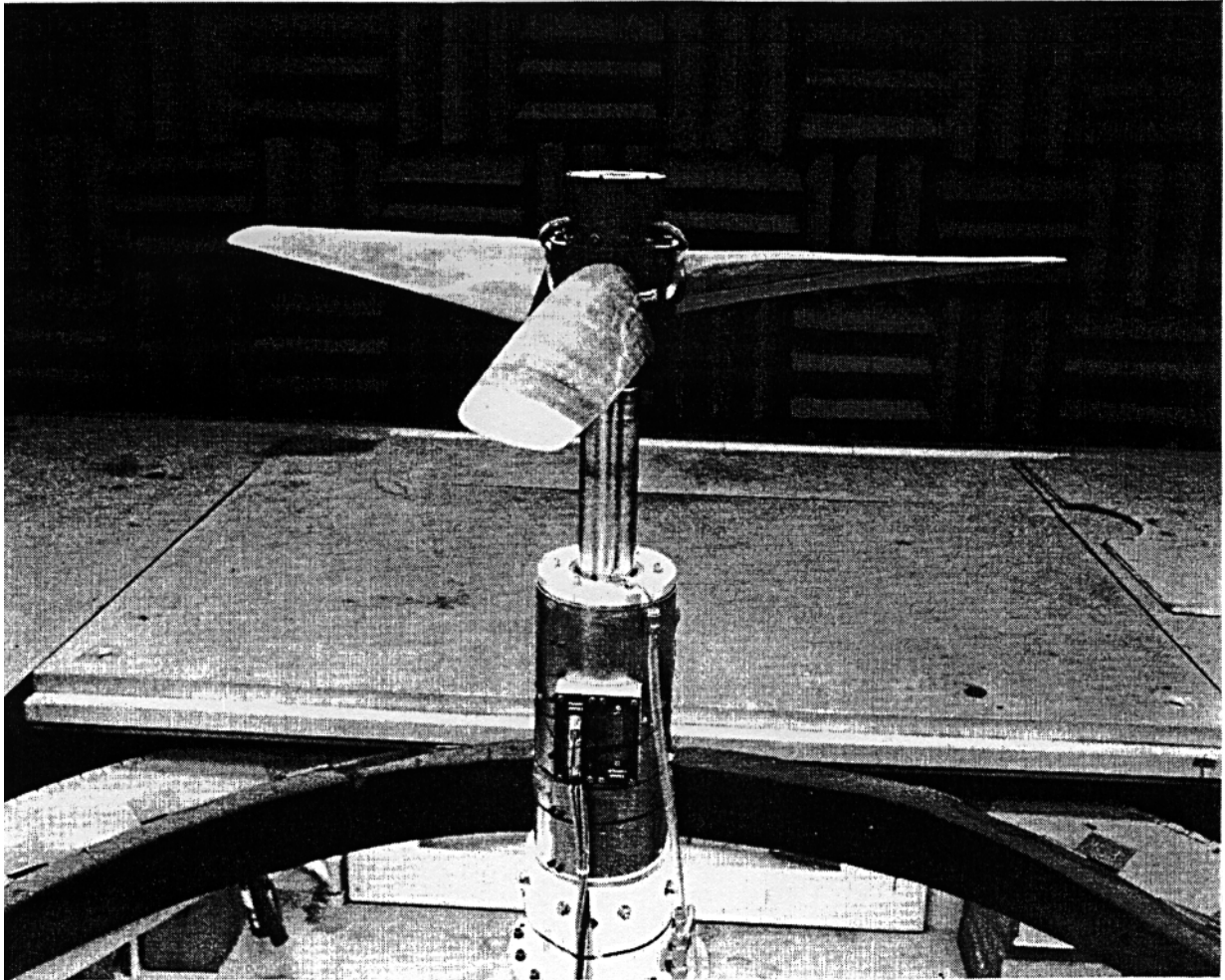
Figure 1. Three-bladed model rotor in the Army anechoic hover chamber.
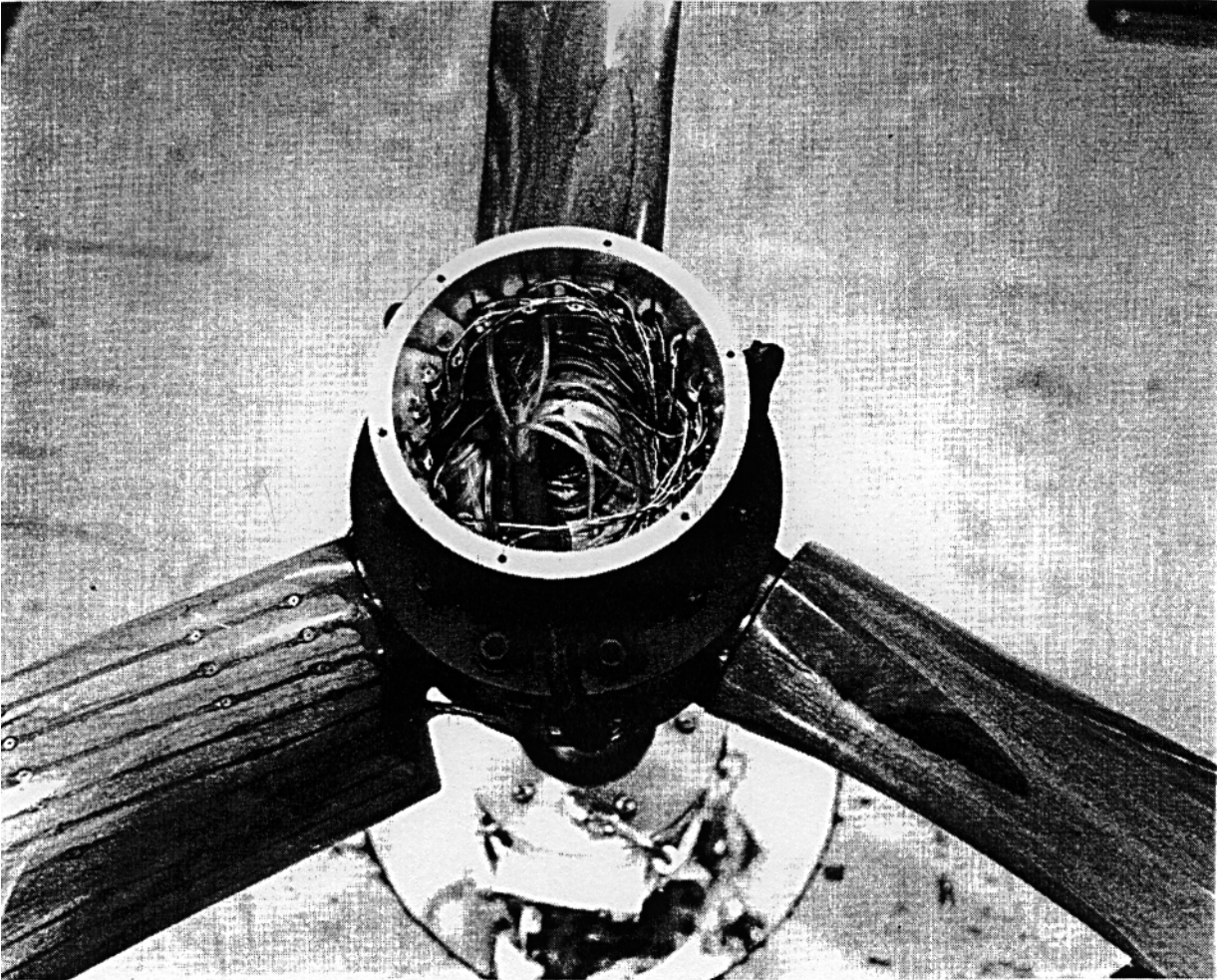
Figure 2. Top view of the model rotor showing the pressure transducers and a partial view of the pressure blade.
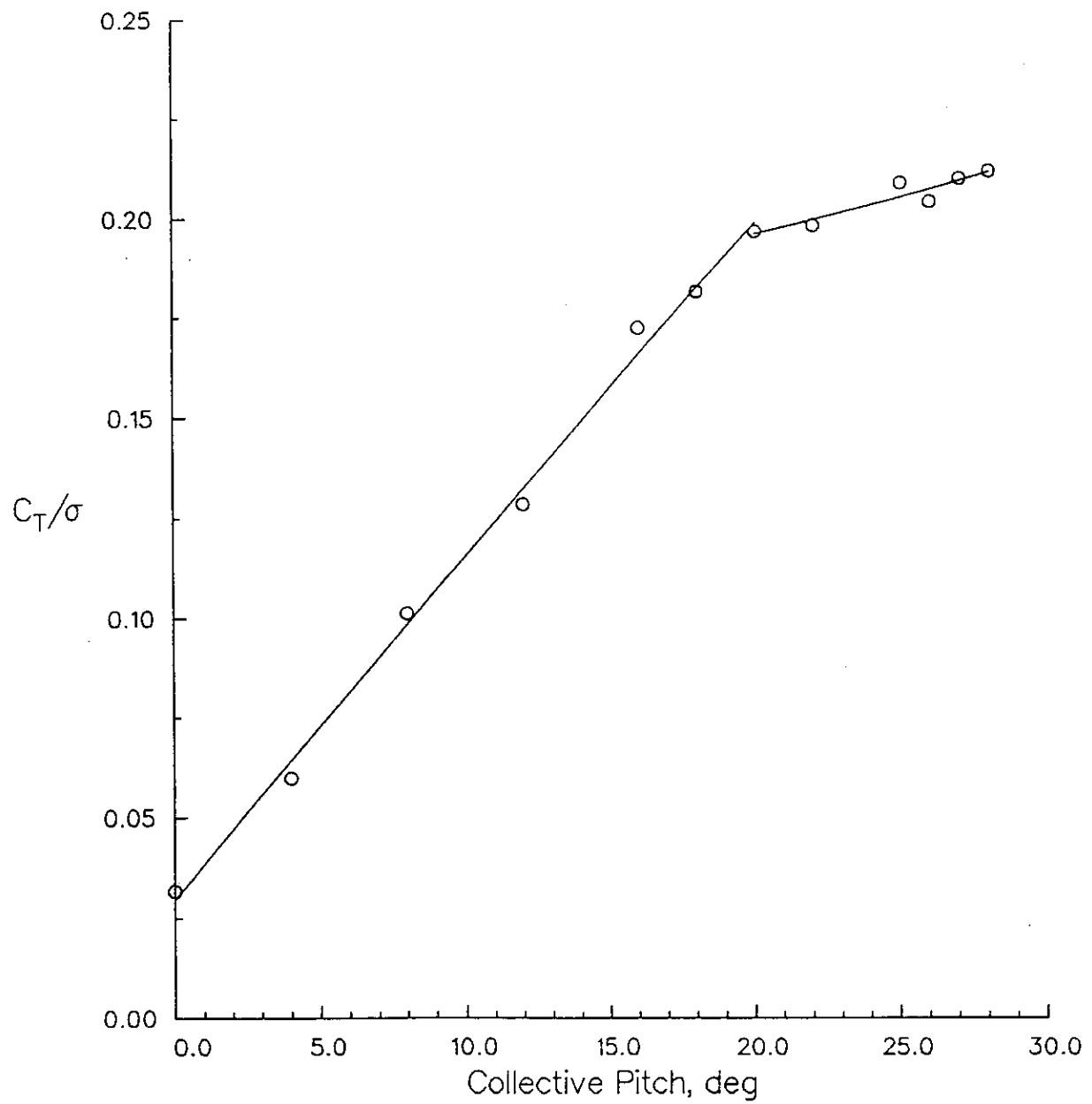
Figure 3. Effect of collective pitch on C_T / σ at 1800 rpm.
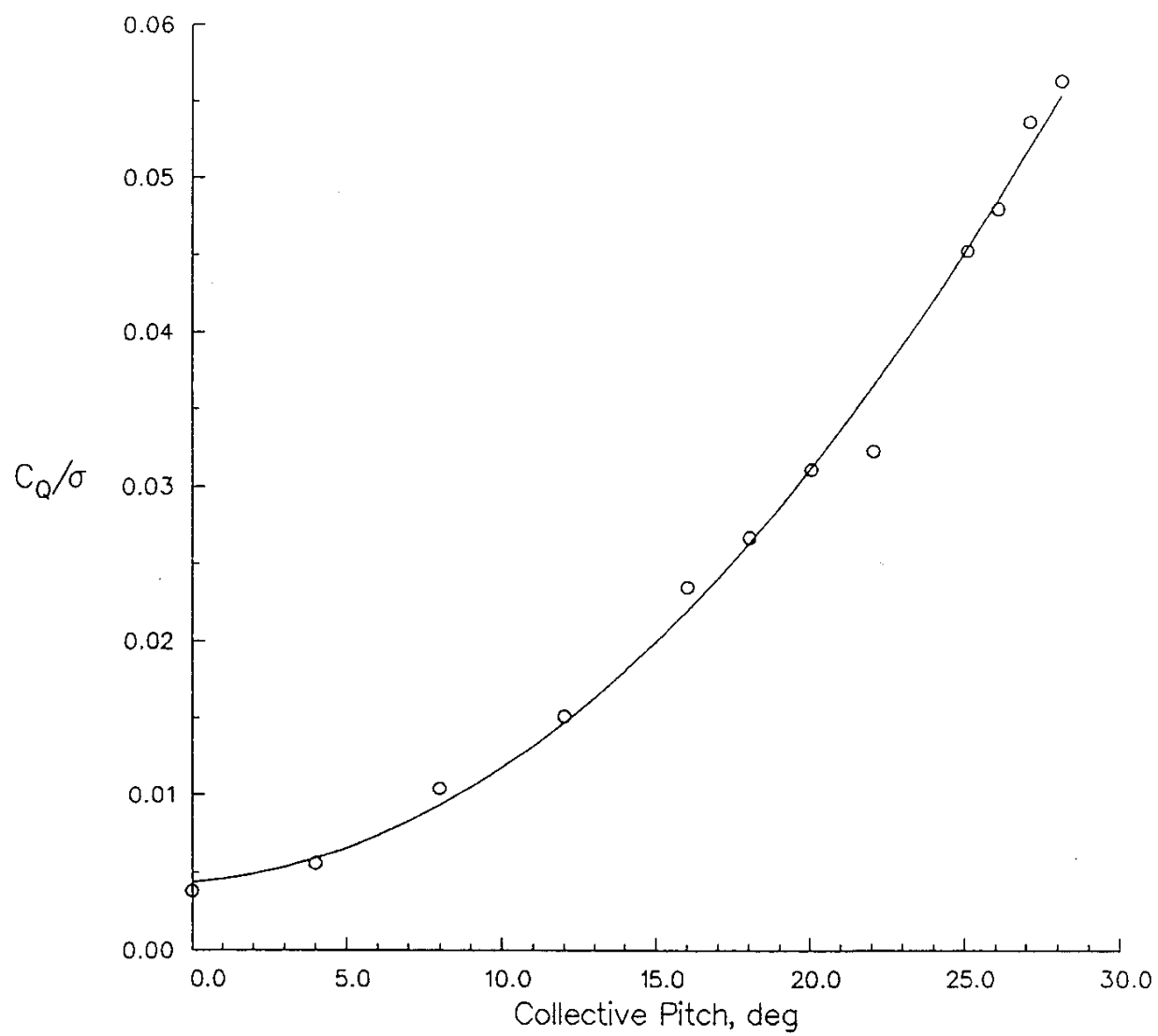
Figure 4. Effect of collective pitch on C_Q/σ at 1800 rpm.
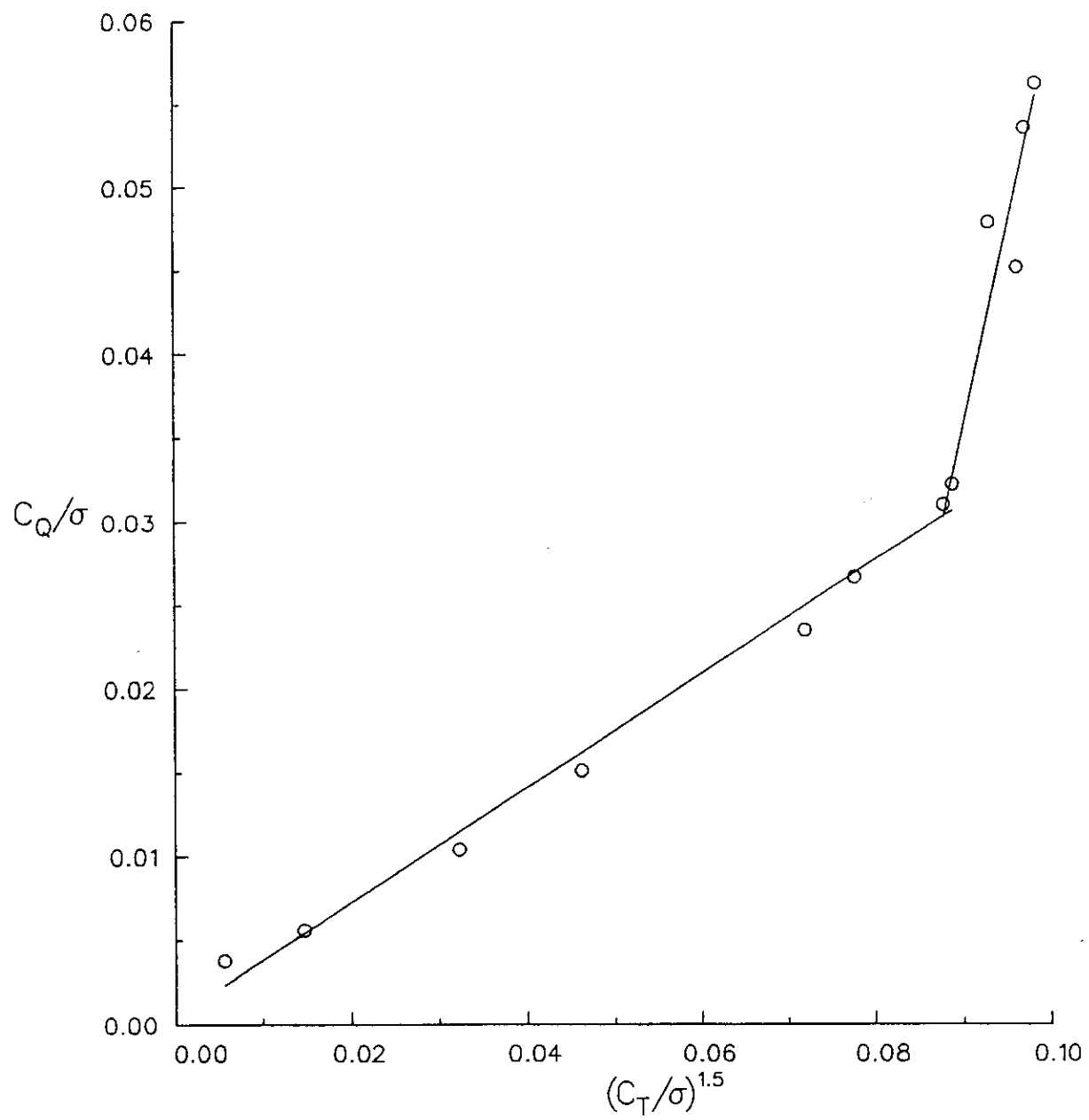
Figure 5. C_Q/σ as a function of $(C_T/\sigma)^{1.5}$ at 1800 rpm.
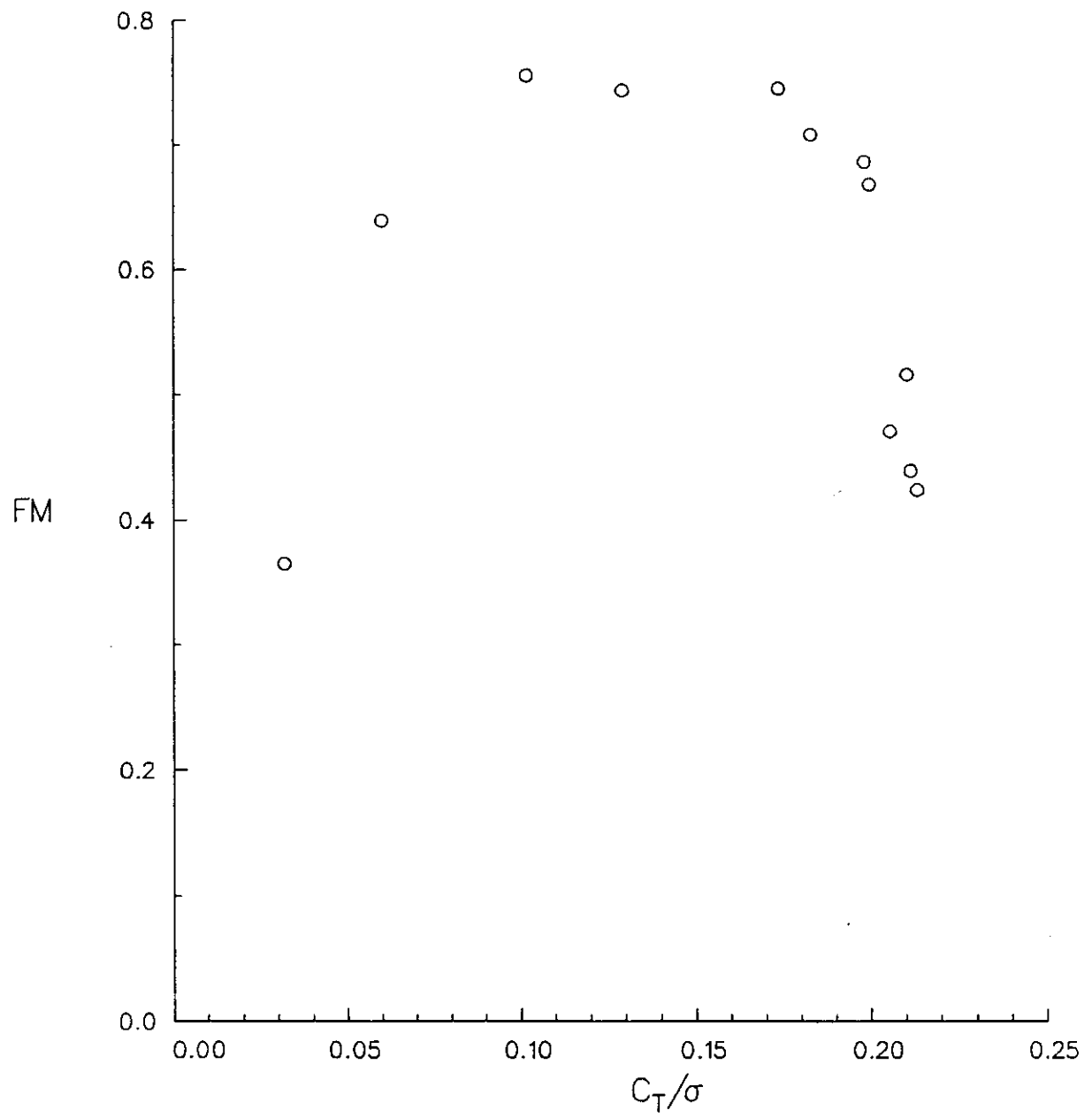
Figure 6. Effect of C_T/σ on rotor performance at 1800 rpm.

(a) $\theta_c = 0°$
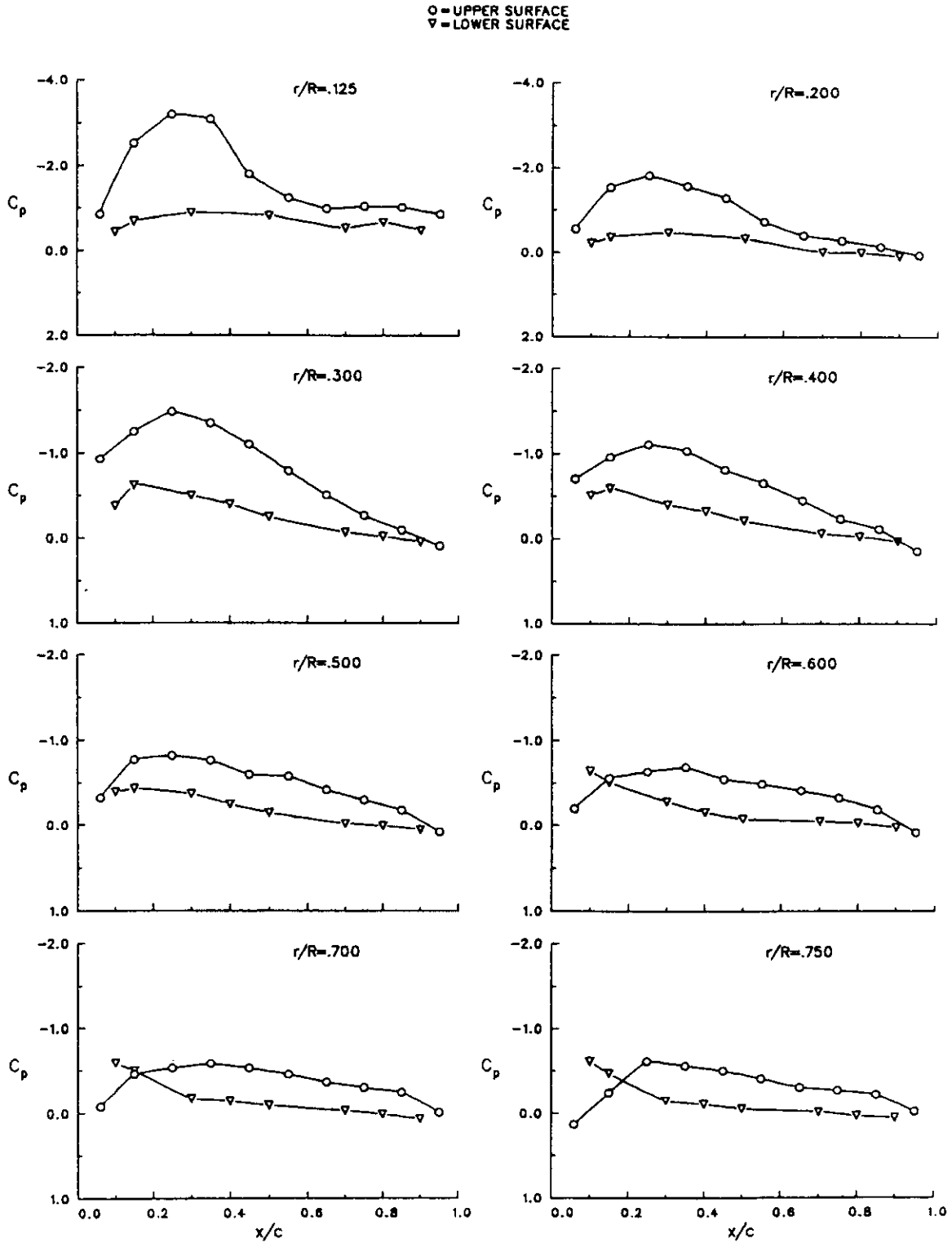
Figure 7. Chordwise pressure distributions along the blade radius; rpm = 1800. (Vertical scale changes from plot to plot.)
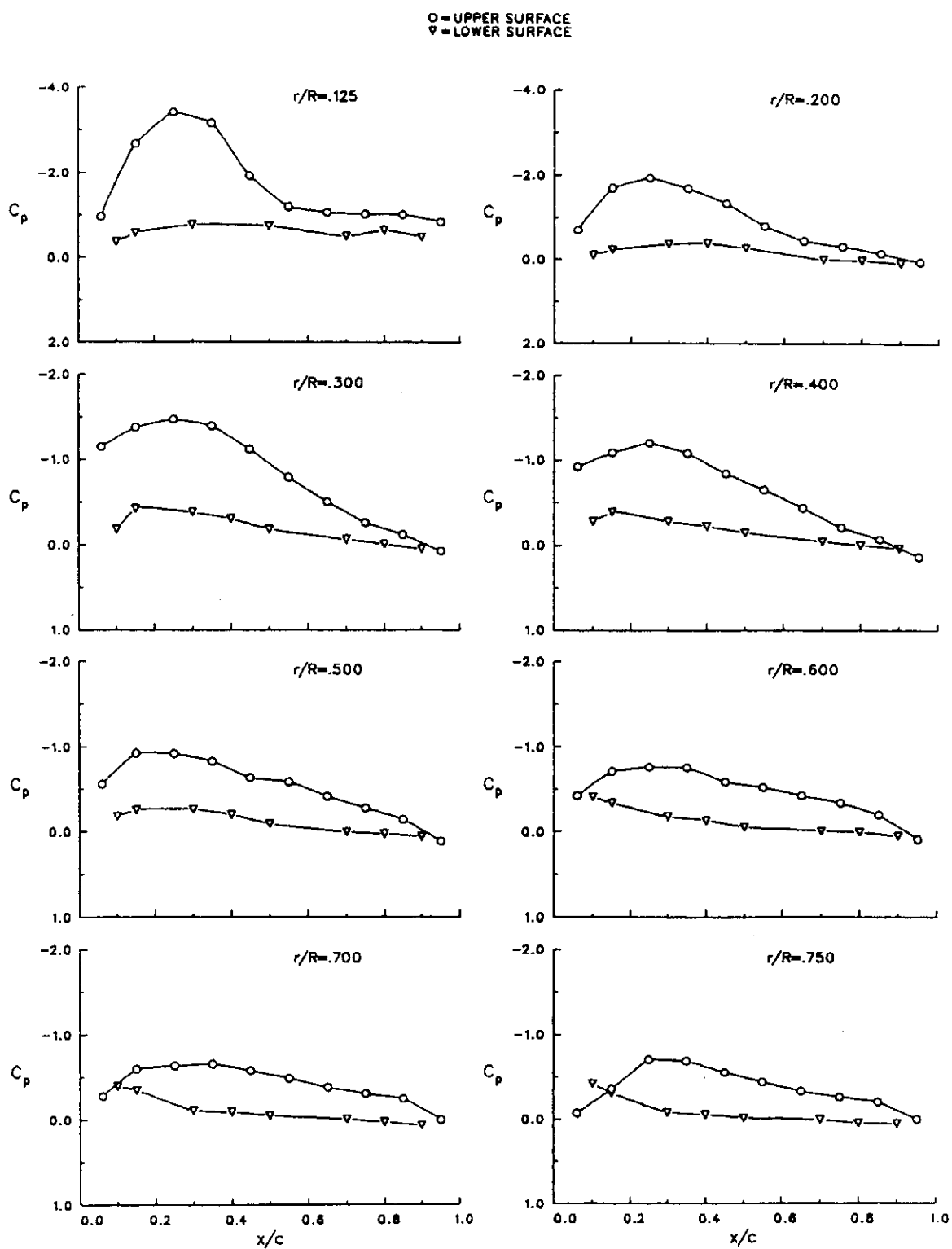
(b) $\theta_c = 4°$

Figure 7. Continued.

12

(c) $\theta_c = 8°$

Figure 7. Continued.

13
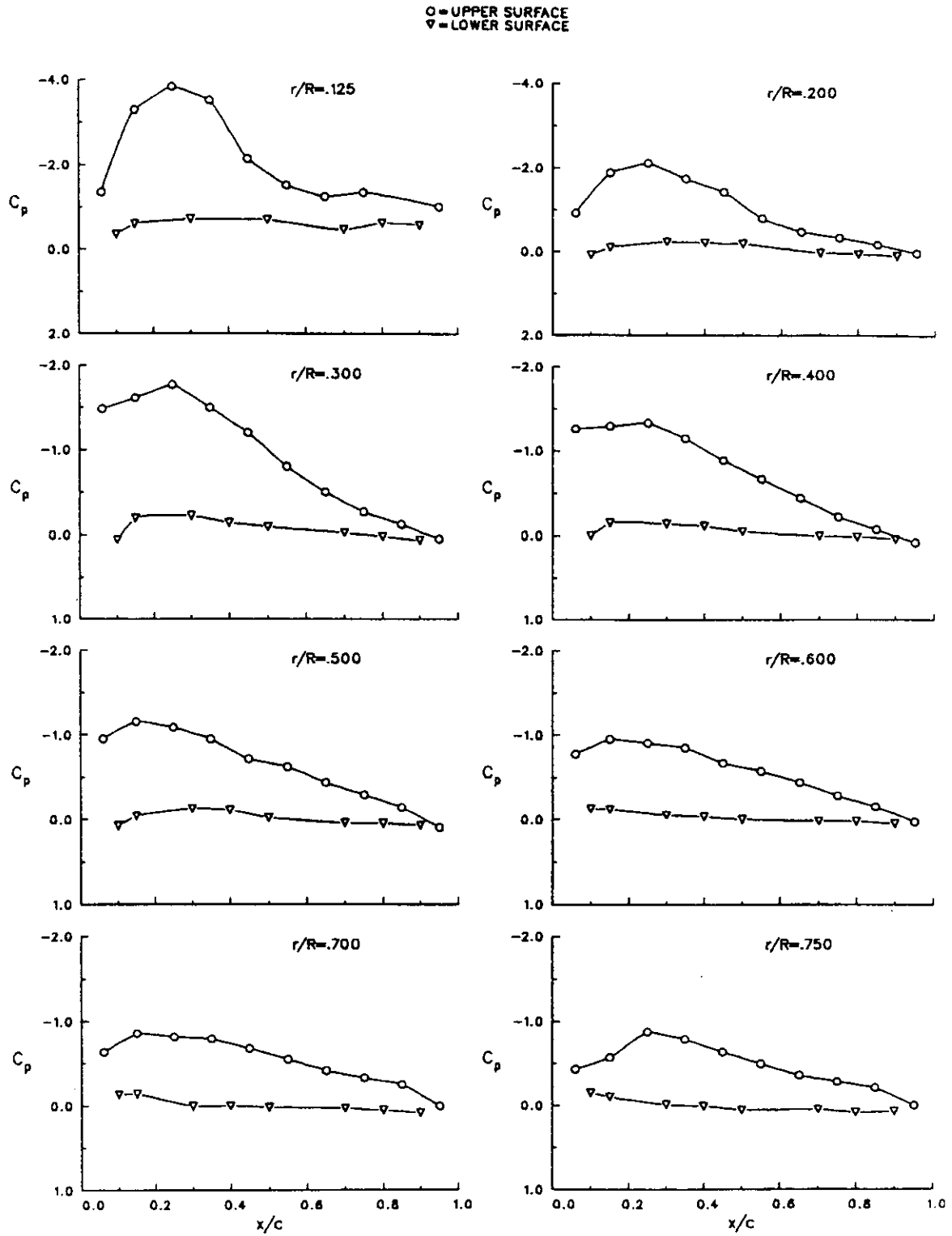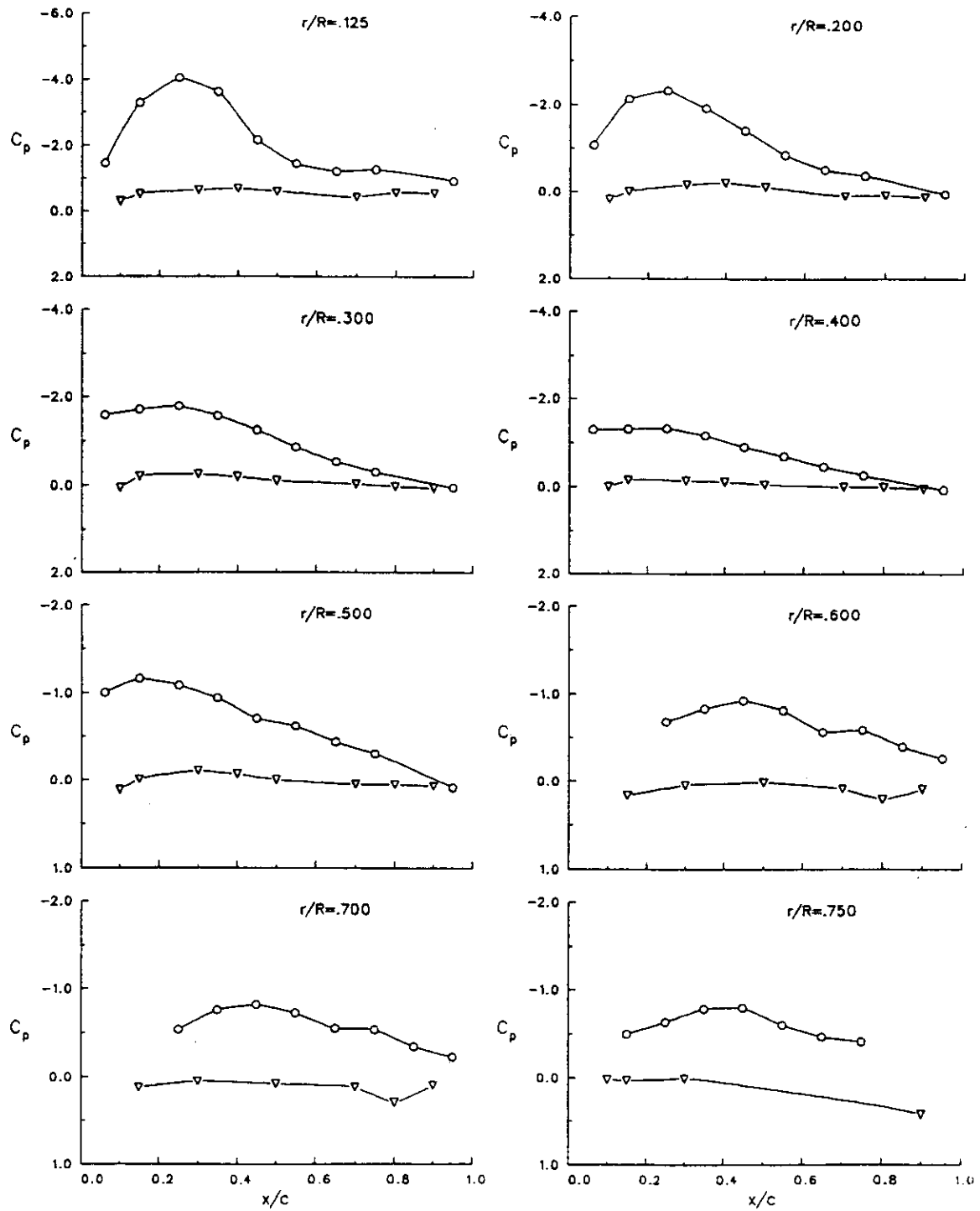
(d) $\theta_c = 12°$

Figure 7. Continued.

14
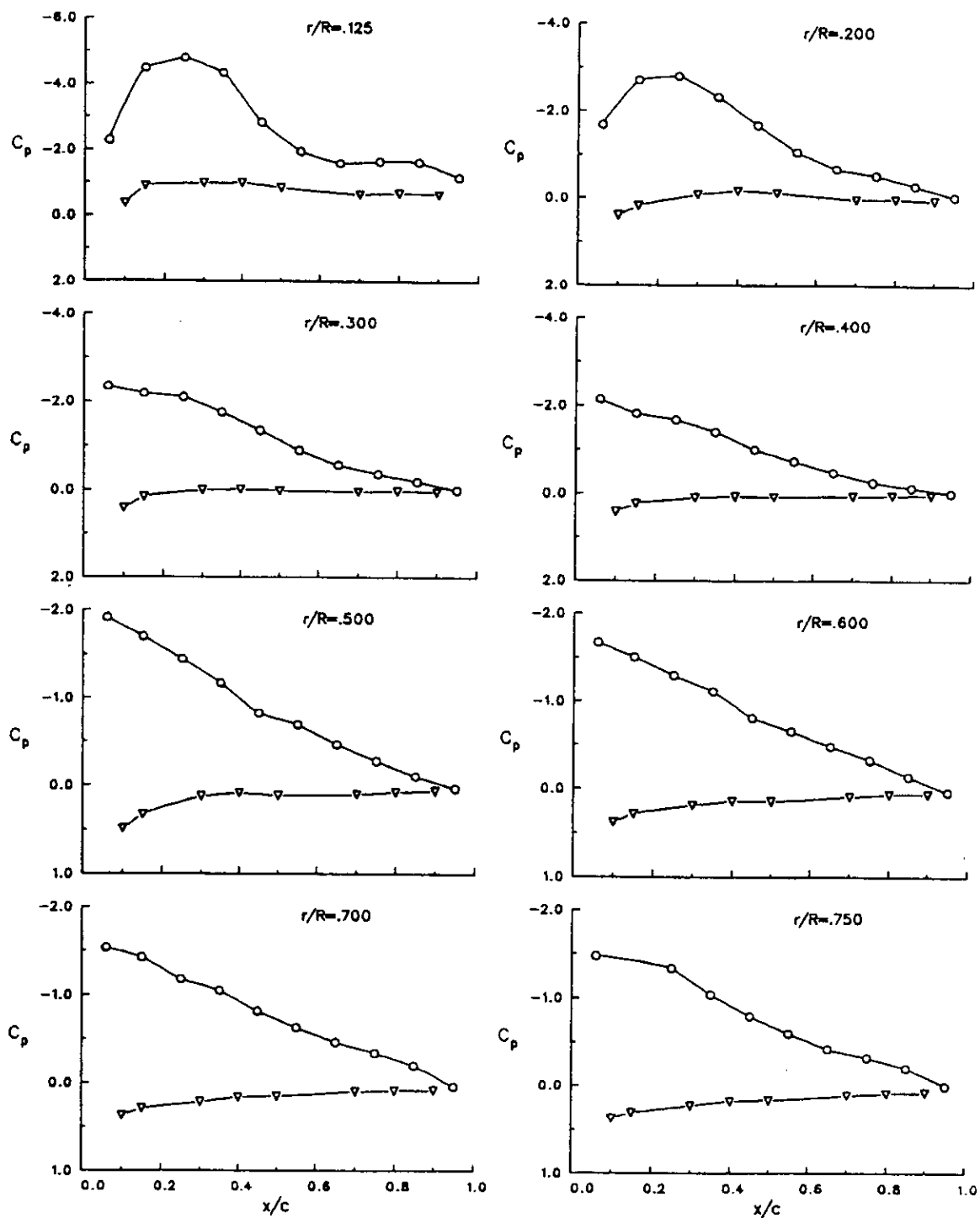
(e) $\theta_c = 16°$
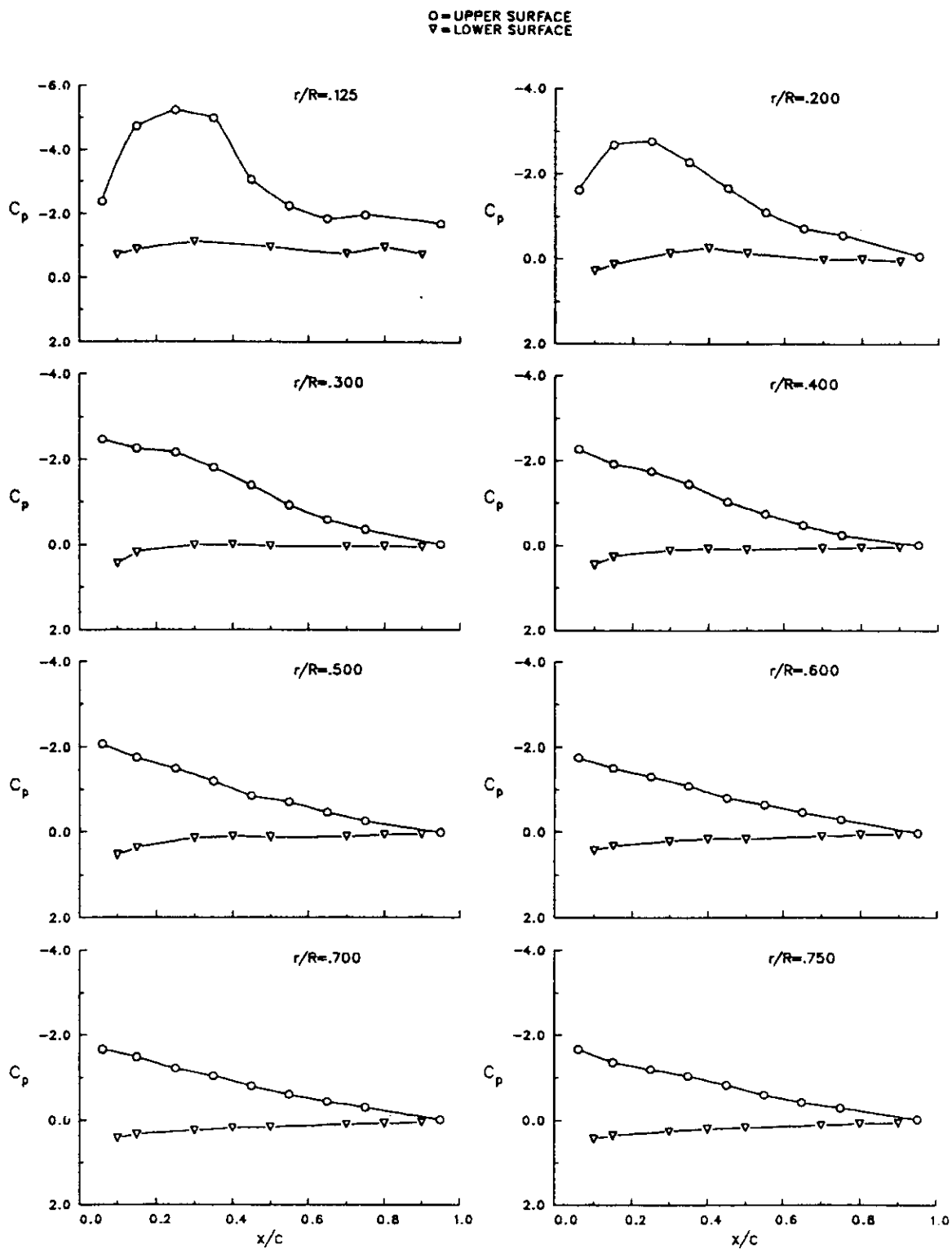
Figure 7. Continued.

(f) $\theta_c = 18°$

Figure 7. Continued.

16
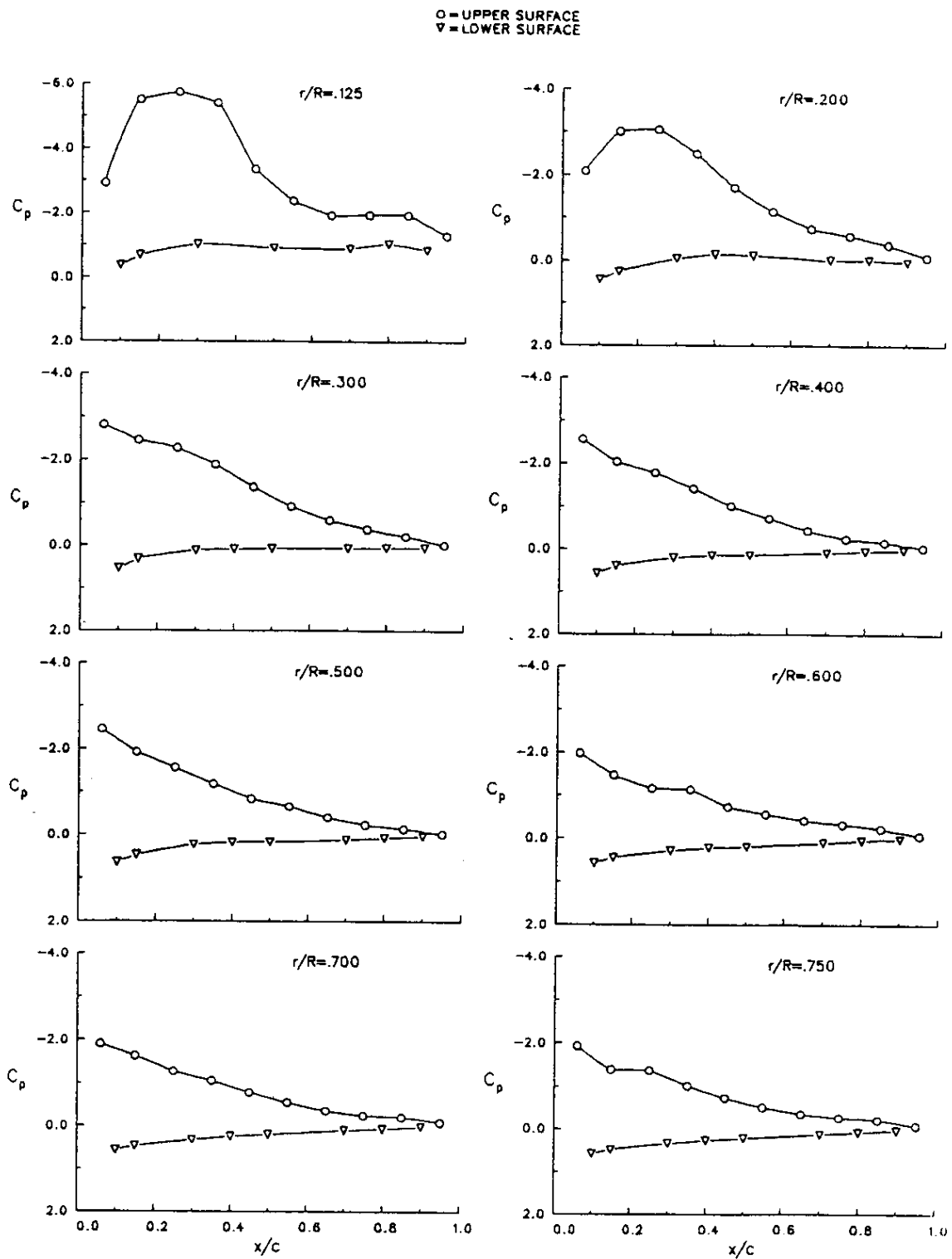
(g) $\theta_c = 20°$

Figure 7. Continued.
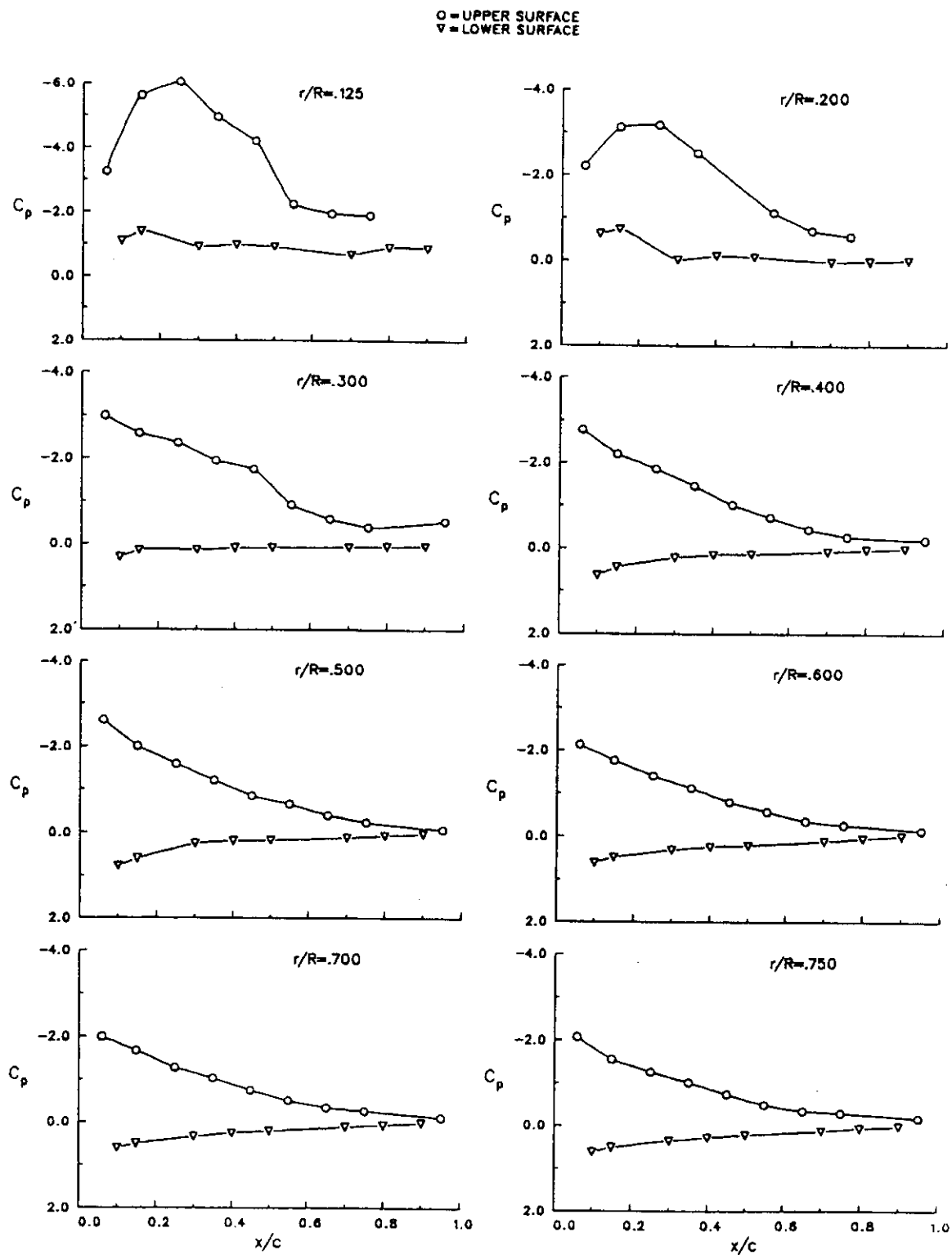
(h) $\theta_c = 22°$

Figure 7. Continued.

18
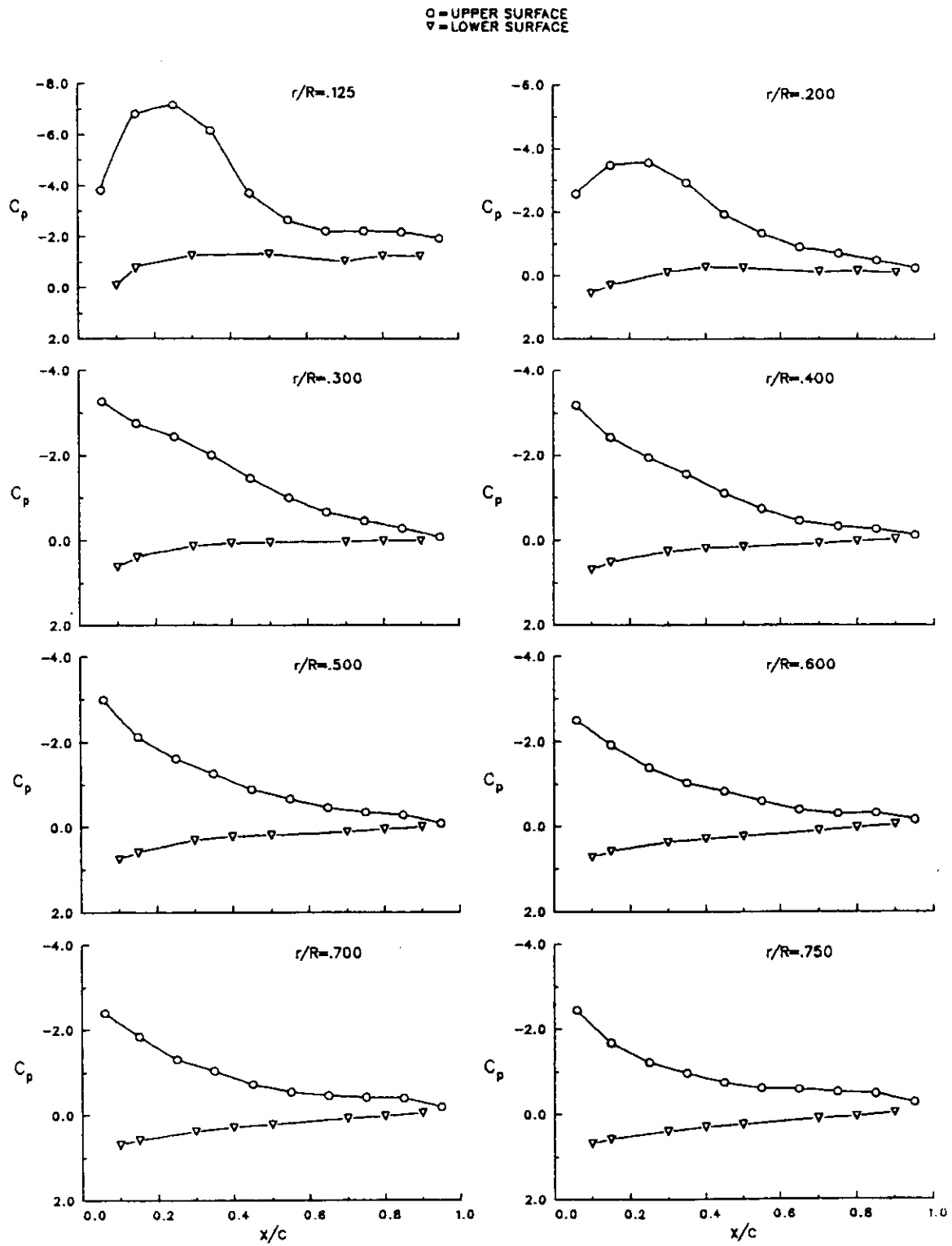
(i) $\theta_c = 25°$

Figure 7. Continued.
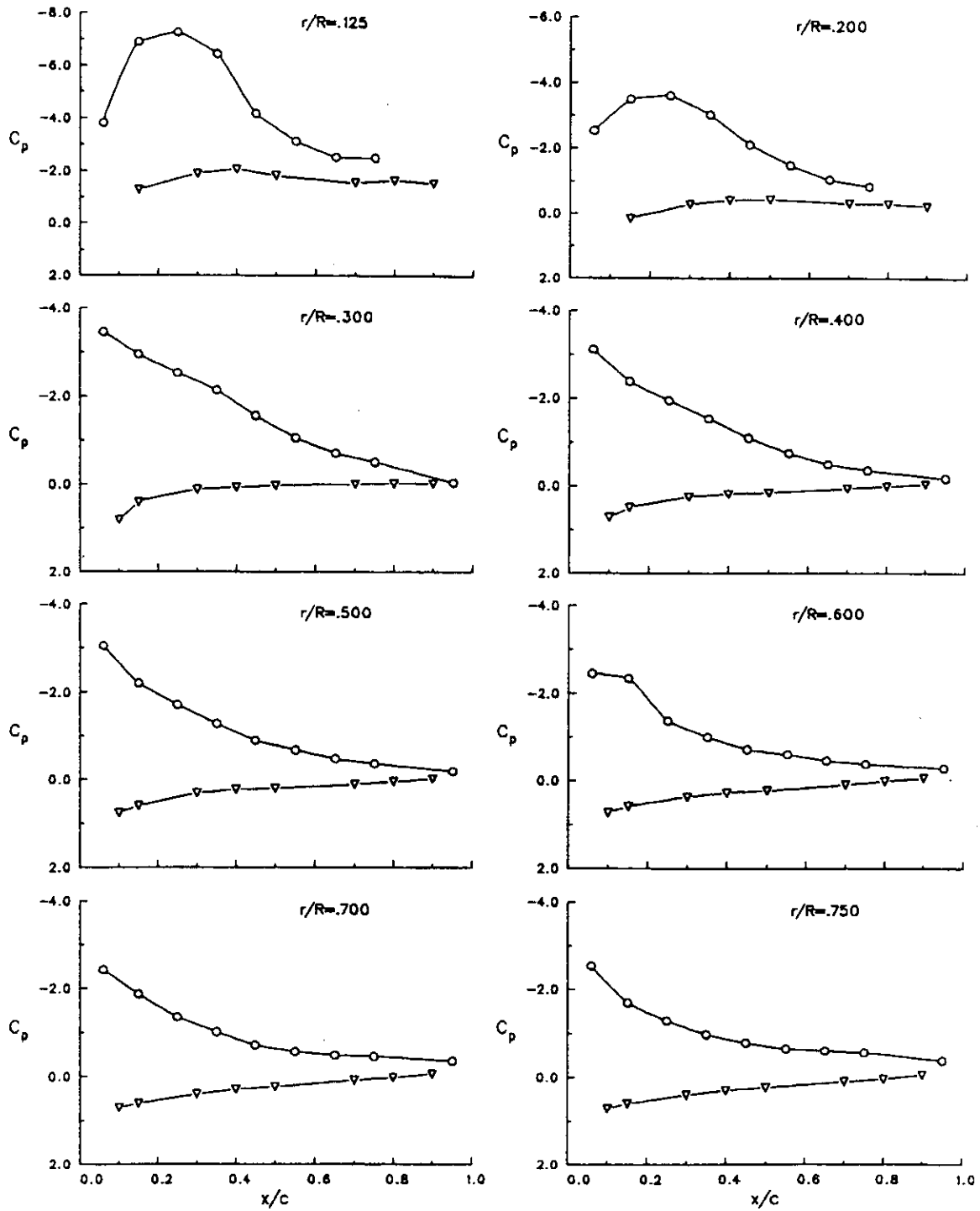
(j) $\theta_c = 26°$

Figure 7. Continued.

O = UPPER SURFACE
▽ = LOWER SURFACE
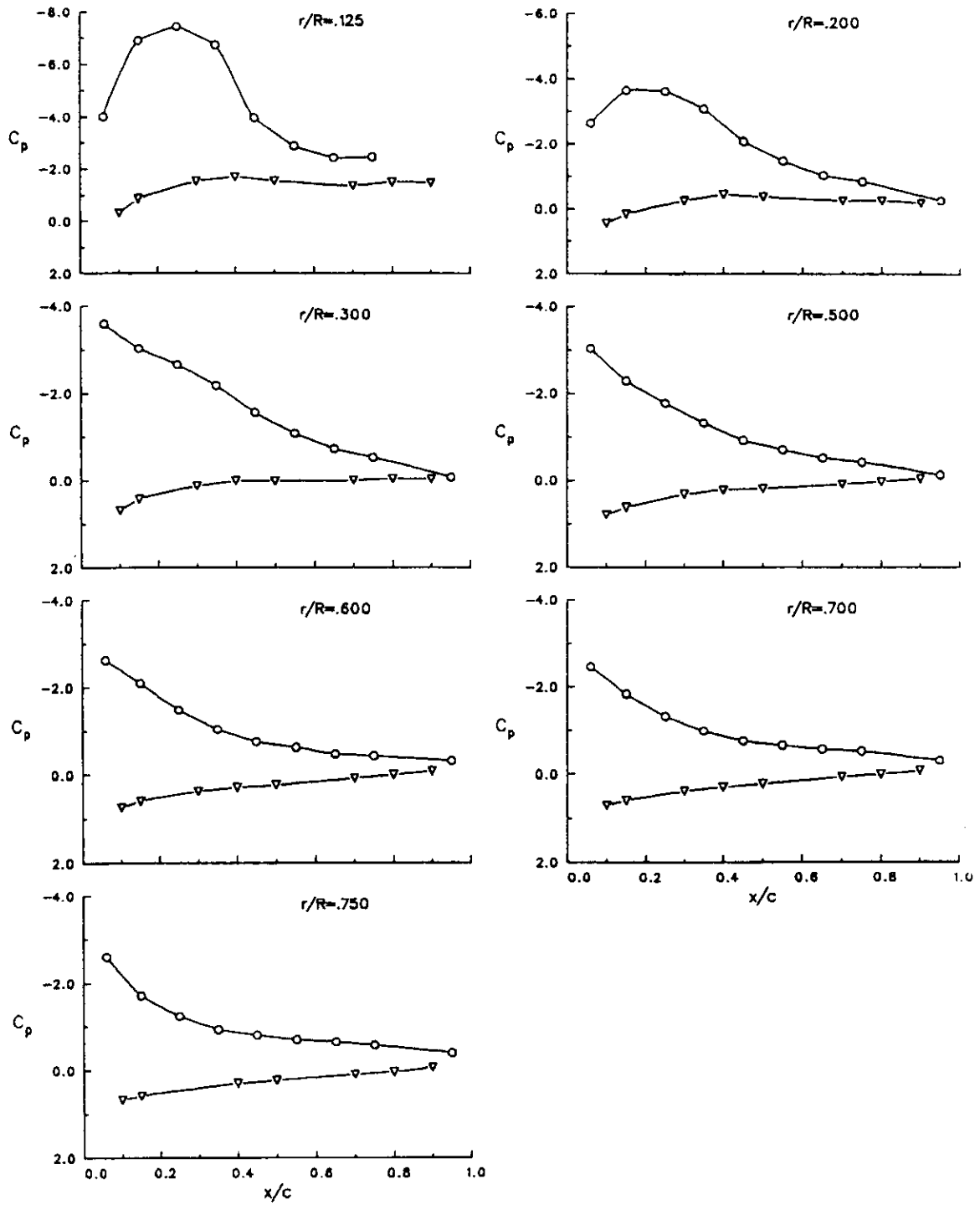
(k) $\theta_c = 27°$

Figure 7. Continued.
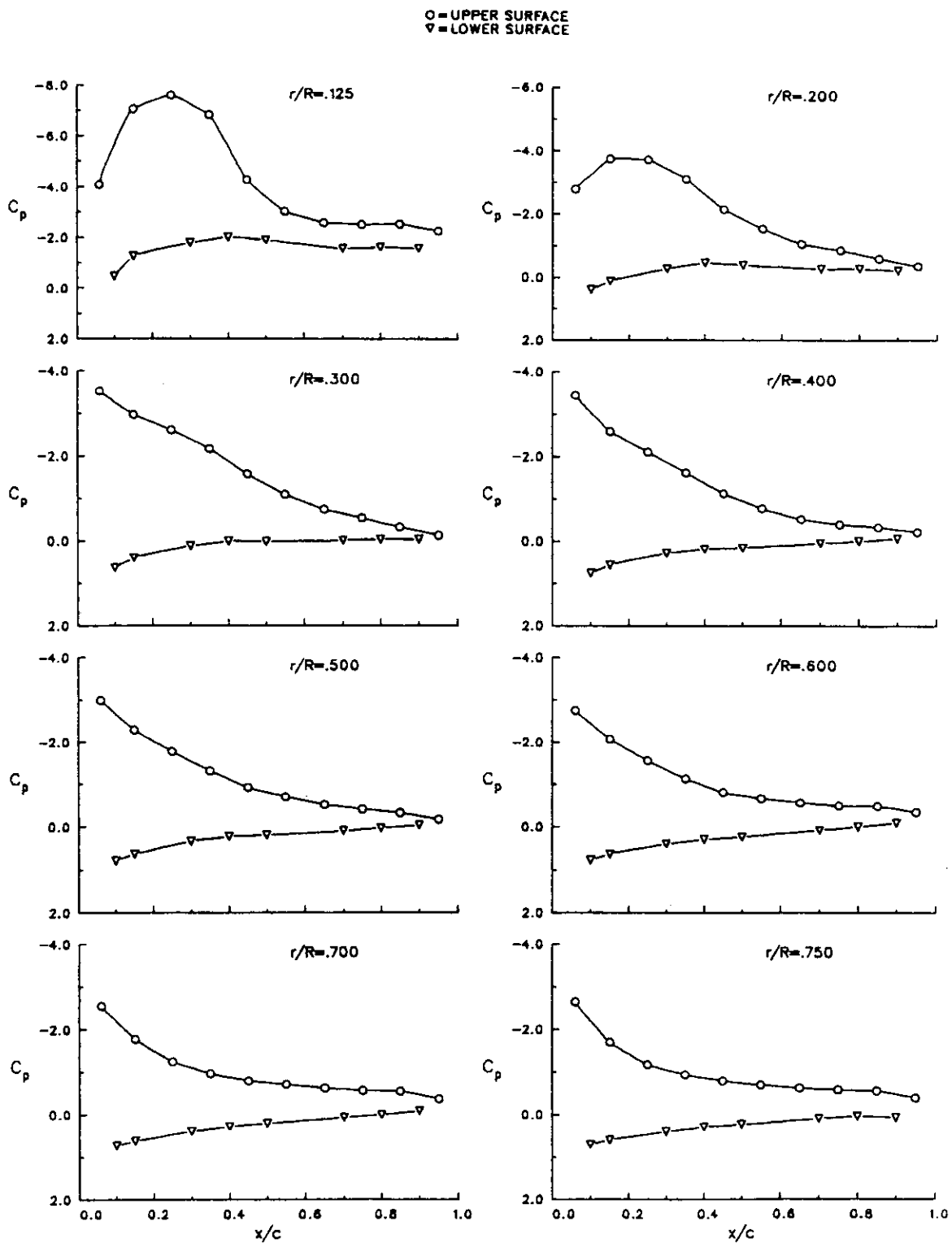
(l) $\theta_c = 28°$

Figure 7. Concluded.
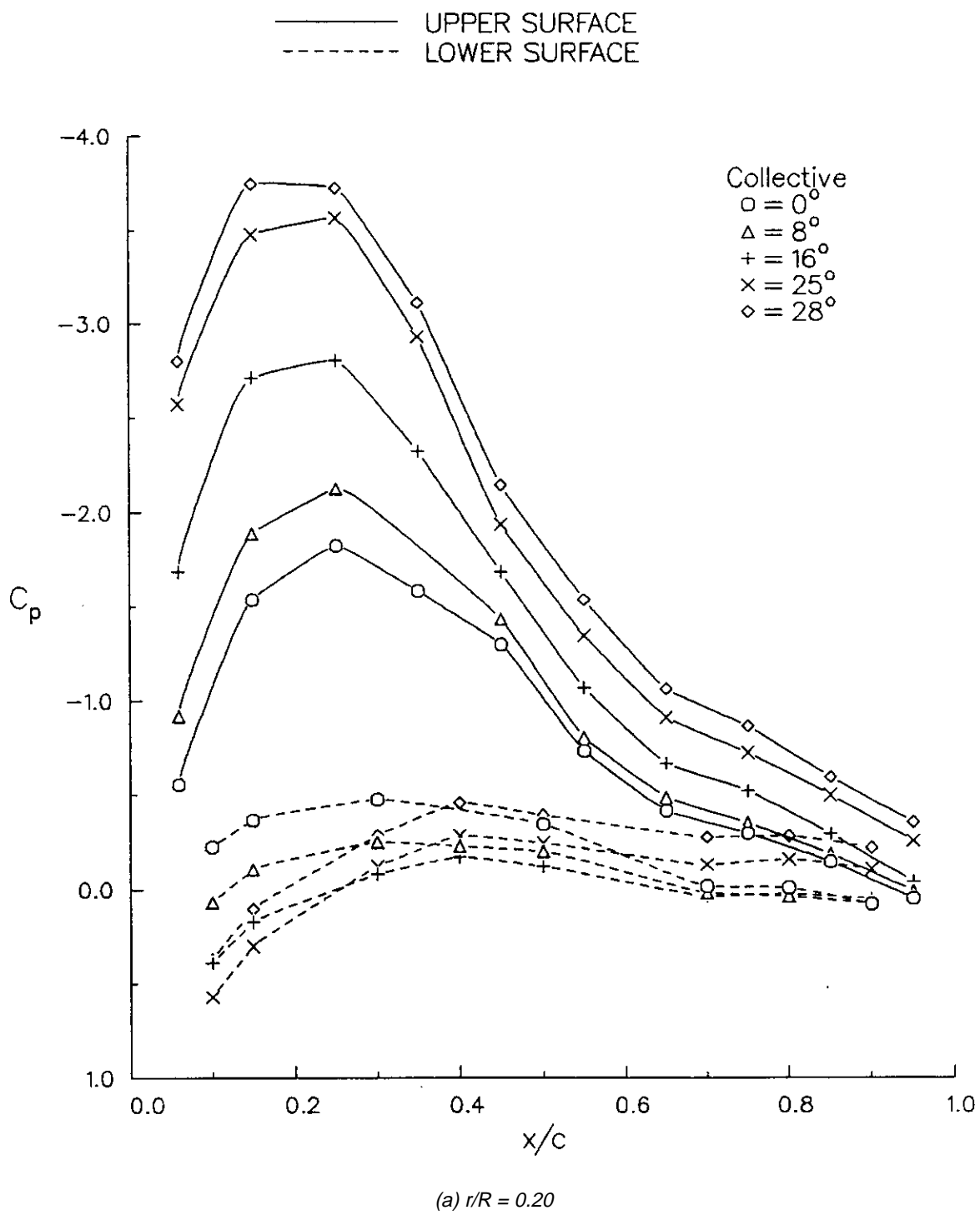
(a) r/R = 0.20

Figure 8. Surface pressure distributions for a range of collective pitch angles; rpm = 1800.

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UPPER SURFACE
LOWER SURFACE

Collective
○ = 0°
△ = 8°
+ = 16°
× = 25°
◇ = 28°

C_p

x/c

(b) r/R = 0.75
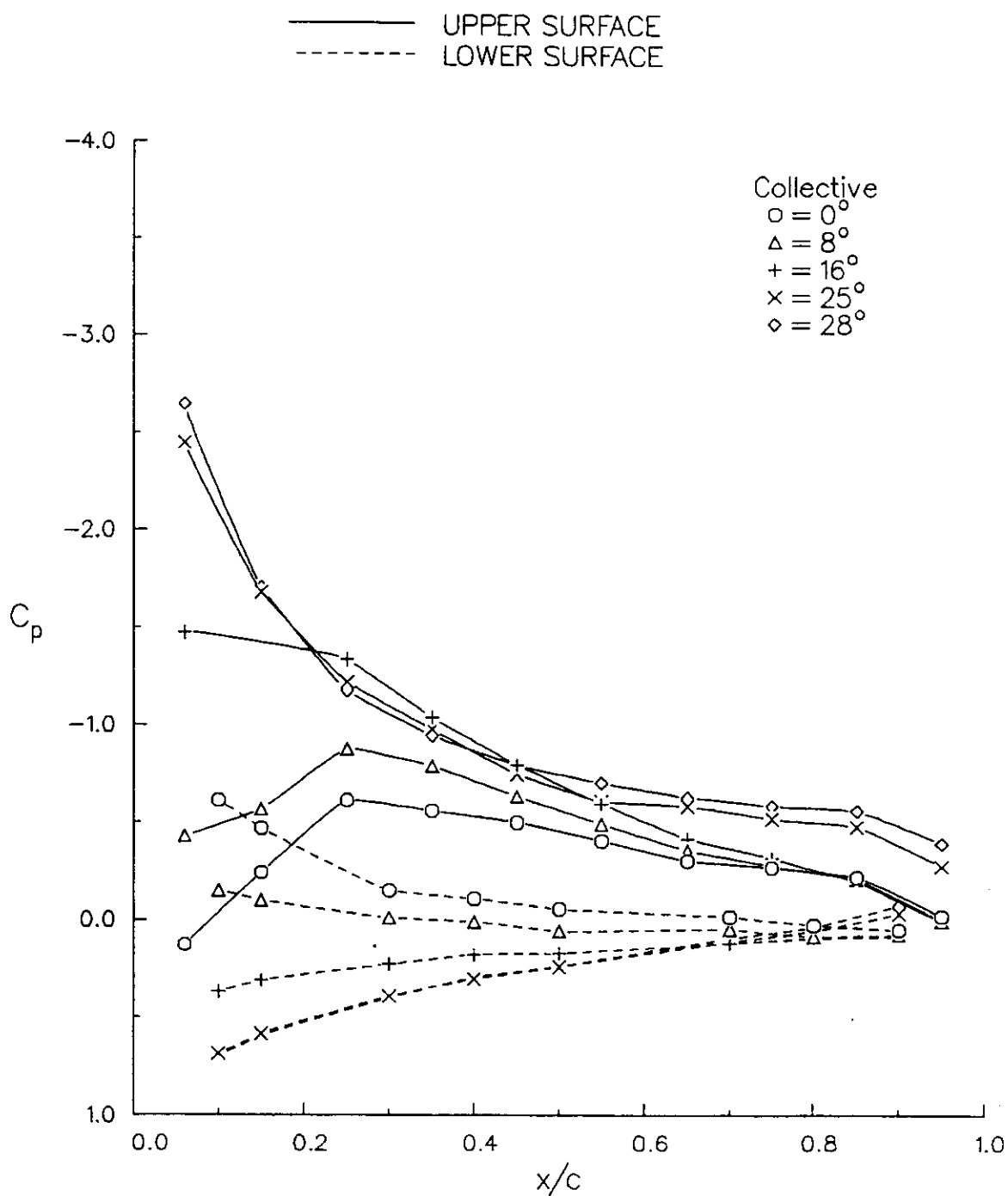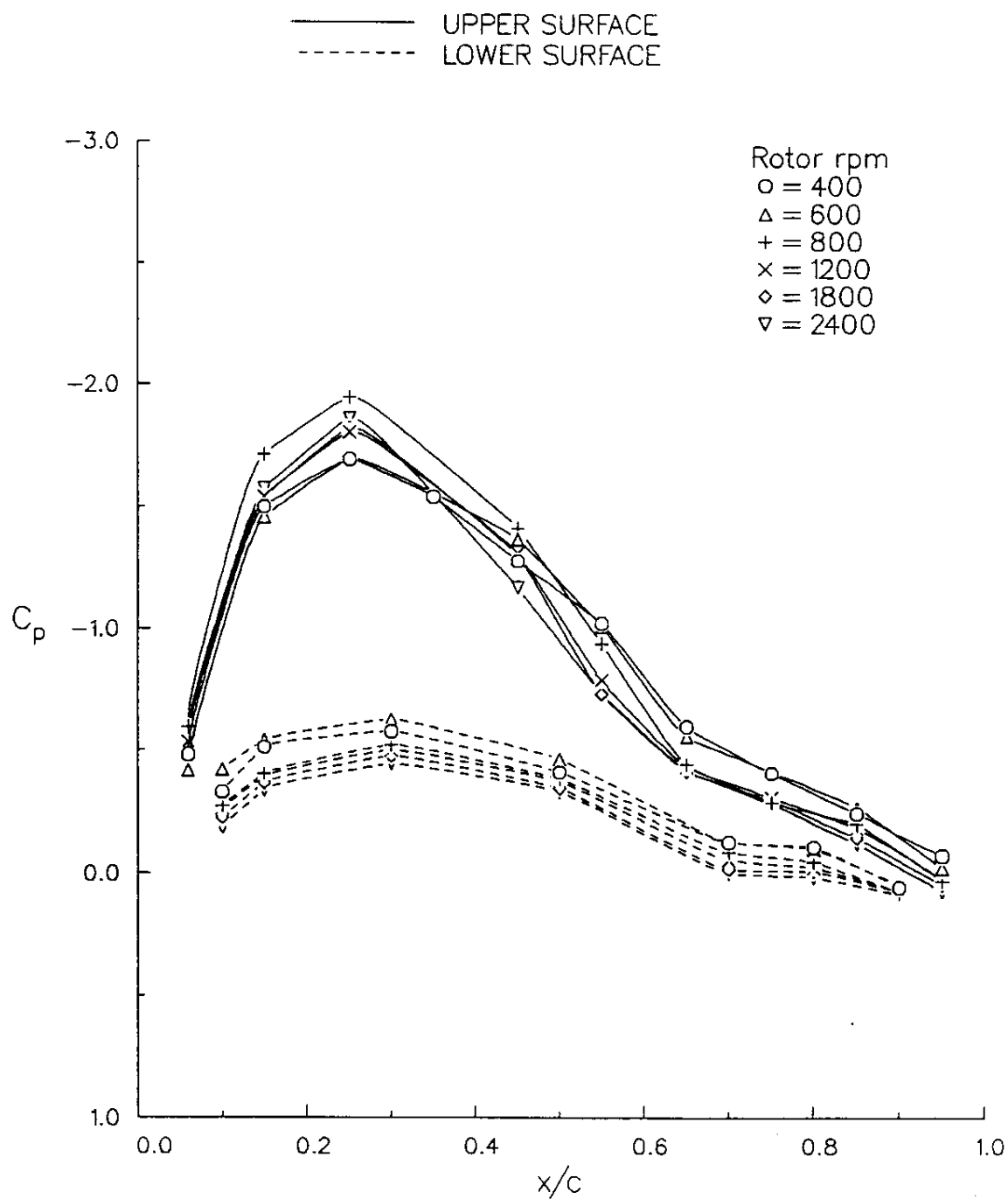
Figure 8. Concluded.

(a) $\theta_c = 0°$

Figure 9. Surface pressure distributions for a range of rotor speeds; r/R = 0.20.
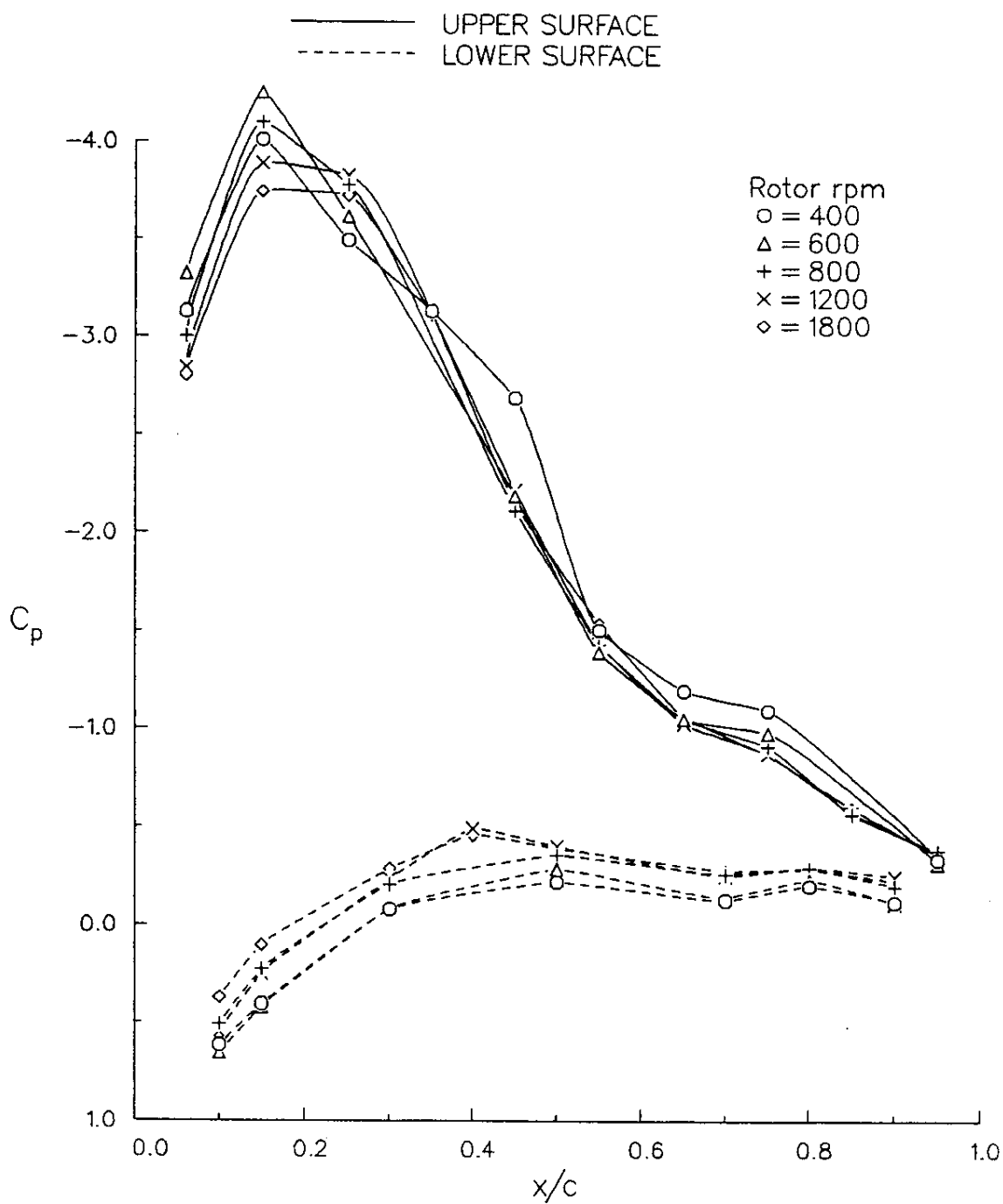
(b) $\theta_c = 28°$

Figure 9. Concluded.

Appendix A

Pressure Blade Airfoil Coordinates

r/R = 0.206

x/c	y/c	x/c	y/c
1.0000	0.0007	0.0114	-0.0485
0.9904	0.0151	0.0194	-0.0595
0.9797	0.0206	0.0318	-0.0732
0.9712	0.0273	0.0526	-0.0905
0.9341	0.0488	0.0811	-0.1084
0.8928	0.0701	0.1067	-0.1206
0.8427	0.0940	0.1186	-0.1253
0.7931	0.1158	0.1454	-0.1345
0.7433	0.1364	0.1878	-0.1455
0.6966	0.1545	0.2261	-0.1533
0.6398	0.1752	0.2566	-0.1583
0.5928	0.1909	0.2937	-0.1626
0.5477	0.2044	0.3418	-0.1663
0.4972	0.2174	0.3929	-0.1672
0.4469	0.2280	0.4415	-0.1650
0.3901	0.2361	0.4971	-0.1591
0.3455	0.2394	0.5393	-0.1521
0.2917	0.2387	0.5929	-0.1409
0.2434	0.2329	0.6392	-0.1294
0.1902	0.2189	0.6867	-0.1168
0.1454	0.1998	0.7361	-0.1028
0.0941	0.1665	0.7947	-0.0864
0.0575	0.1305	0.8430	-0.0718
0.0407	0.1095	0.8905	-0.0570
0.0338	0.0996	0.9196	-0.0470
0.0165	0.0685	0.9503	-0.0355
0.0094	0.0506	0.9815	-0.0216
0.0017	0.0193	0.9859	-0.0172
0.0000	-0.0072	0.9918	-0.0114
0.0020	-0.0228	0.9996	-0.0062
0.0097	-0.0446	1.0000	0.0007

r/R = 0.155

x/c	y/c	x/c	y/c
1.0000	0.0059	0.0124	-0.0660
0.9974	0.0114	0.0161	-0.0725
0.9911	0.0167	0.0258	-0.0861
0.9764	0.0250	0.0379	-0.0998
0.9423	0.0424	0.0516	-0.1133
0.8857	0.0674	0.0706	-0.1296
0.8495	0.0827	0.0902	-0.1439
0.7881	0.1069	0.1101	-0.1567
0.7415	0.1250	0.1335	-0.1691
0.6922	0.1432	0.1560	-0.1798
0.6381	0.1626	0.1997	-0.1949
0.5878	0.1801	0.2174	-0.1994
0.5434	0.1945	0.2405	-0.2041
0.4907	0.2119	0.2628	-0.2071
0.4414	0.2258	0.2762	-0.2087
0.3915	0.2376	0.2983	-0.2108
0.3399	0.2457	0.3449	-0.2125
0.2895	0.2474	0.3984	-0.2116
0.2424	0.2406	0.4542	-0.2066
0.1913	0.2246	0.5548	-0.1854
0.1416	0.1991	0.5988	-0.1725
0.0946	0.1641	0.6524	-0.1548
0.0533	0.1193	0.6961	-0.1397
0.0423	0.1043	0.7460	-0.1214
0.0385	0.0986	0.7986	-0.1017
0.0215	0.0702	0.8475	-0.0822
0.0081	0.0380	0.8935	-0.0631
0.0020	0.0130	0.9409	-0.0413
0.0000	-0.0122	0.9767	-0.0216
0.0010	-0.0281	0.9942	-0.0057
0.0041	-0.0447	0.9973	-0.0023
0.0073	-0.0547	1.0000	0.0059
0.0117	-0.0647		

r/R = 0.405

x/c	y/c	x/c	y/c
1.0000	0.0180	0.0161	-0.0194
0.9854	0.0258	0.0307	-0.0332
0.9549	0.0430	0.0476	-0.0454
0.9105	0.0629	0.0693	-0.0576
0.8540	0.0837	0.0753	-0.0606
0.8062	0.0986	0.0956	-0.0688
0.7542	0.1133	0.1190	-0.0758
0.6968	0.1284	0.1468	-0.0818
0.6523	0.1390	0.1930	-0.0873
0.5999	0.1499	0.2458	-0.0904
0.5510	0.1586	0.3018	-0.0912
0.5044	0.1652	0.3471	-0.0902
0.4472	0.1714	0.3963	-0.0883
0.3941	0.1747	0.4452	-0.0850
0.3443	0.1753	0.4960	-0.0809
0.2989	0.1732	0.5482	-0.0756
0.2488	0.1675	0.5956	-0.0708
0.1951	0.1559	0.6500	-0.0643
0.1468	0.1419	0.6959	-0.0584
0.1025	0.1241	0.7544	-0.0501
0.0590	0.1000	0.7986	-0.0436
0.0406	0.0858	0.8453	-0.0360
0.0363	0.0819	0.8995	-0.0267
0.0265	0.0719	0.9250	-0.0217
0.0174	0.0609	0.9613	-0.0138
0.0081	0.0457	0.9819	-0.0080
0.0032	0.0334	0.9967	0.0006
0.0004	0.0183	1.0012	0.0051
0.0014	0.0069	1.0000	0.0180
0.0066	-0.0065		

r/R = 0.306

x/c	y/c	x/c	y/c
1.0000	-0.0025	0.0265	-0.0525
0.9942	0.0054	0.0433	-0.0680
0.9824	0.0114	0.0525	-0.0753
0.9691	0.0190	0.0704	-0.0873
0.9482	0.0304	0.0898	-0.0979
0.9188	0.0451	0.0991	-0.1023
0.8755	0.0648	0.1194	-0.1102
0.8256	0.0858	0.1409	-0.1173
0.7808	0.1033	0.1616	-0.1221
0.7296	0.1220	0.1723	-0.1240
0.6785	0.1394	0.1884	-0.1264
0.6295	0.1545	0.2218	-0.1294
0.5773	0.1684	0.2888	-0.1305
0.5380	0.1777	0.3477	-0.1282
0.4814	0.1890	0.3875	-0.1256
0.4360	0.1958	0.4367	-0.1210
0.3879	0.1998	0.4907	-0.1151
0.3385	0.2009	0.5377	-0.1089
0.2885	0.1969	0.5808	-0.1025
0.2399	0.1901	0.6293	-0.0943
0.1867	0.1768	0.6810	-0.0851
0.1426	0.1607	0.7264	-0.0765
0.0992	0.1394	0.7763	-0.0670
0.0576	0.1101	0.8250	-0.0568
0.0314	0.0829	0.8730	-0.0464
0.0241	0.0727	0.9089	-0.0378
0.0104	0.0477	0.9517	-0.0265
0.0029	0.0259	0.9779	-0.0173
0.0004	0.0034	0.9886	-0.0127
0.0070	-0.0259	1.0000	-0.0025
0.0076	-0.0276		

r/R = 0.606

x/c	y/c	x/c	y/c
1.0000	0.0018	0.0098	-0.0284
0.9956	0.0112	0.0229	-0.0399
0.9813	0.0171	0.0364	-0.0482
0.9448	0.0307	0.0555	-0.0565
0.8976	0.0454	0.0962	-0.0669
0.8477	0.0594	0.1202	-0.0699
0.7970	0.0719	0.1451	-0.0718
0.7480	0.0825	0.1934	-0.0737
0.6912	0.0925	0.2500	-0.0735
0.6460	0.0993	0.2844	-0.0726
0.5956	0.1054	0.3479	-0.0704
0.5356	0.1111	0.3930	-0.0683
0.4900	0.1141	0.4464	-0.0654
0.4488	0.1160	0.4981	-0.0623
0.3941	0.1169	0.5401	-0.0595
0.3437	0.1157	0.5925	-0.0557
0.2890	0.1113	0.6449	-0.0514
0.2394	0.1052	0.6920	-0.0477
0.1897	0.0959	0.7383	-0.0436
0.1477	0.0854	0.7945	-0.0383
0.1044	0.0700	0.8516	-0.0321
0.0619	0.0506	0.8951	-0.0273
0.0391	0.0375	0.9237	-0.0236
0.0176	0.0217	0.9532	-0.0193
0.0037	0.0058	0.9774	-0.0143
0.0001	-0.0087	0.9930	-0.0120
0.0006	-0.0134	1.0000	0.0018

r/R = 0.506

x/c	y/c	x/c	y/c
1.0000	0.0024	0.0109	-0.0128
0.9955	0.0101	0.0302	-0.0275
0.9845	0.0156	0.0619	-0.0424
0.9517	0.0291	0.0683	-0.0448
0.9050	0.0450	0.0899	-0.0515
0.8547	0.0607	0.1152	-0.0577
0.8068	0.0737	0.1444	-0.0631
0.7525	0.0875	0.1860	-0.0684
0.7033	0.0984	0.2410	-0.0720
0.6532	0.1083	0.2931	-0.0734
0.6078	0.1161	0.3499	-0.0722
0.5471	0.1246	0.4019	-0.0697
0.4974	0.1296	0.4499	-0.0663
0.4480	0.1332	0.5005	-0.0628
0.3981	0.1360	0.5488	-0.0588
0.3497	0.1372	0.6039	-0.0543
0.2952	0.1354	0.6431	-0.0506
0.2453	0.1305	0.7006	-0.0453
0.1943	0.1216	0.7501	-0.0406
0.1491	0.1102	0.8013	-0.0355
0.0997	0.0920	0.8433	-0.0311
0.0537	0.0690	0.9010	-0.0247
0.0350	0.0565	0.9326	-0.0208
0.0154	0.0393	0.9639	-0.0156
0.0049	0.0255	0.9841	-0.0095
0.0000	0.0102	0.9930	-0.0070
0.0012	0.0018	1.0000	0.0024

r/R = 0.756

x/c	y/c	x/c	y/c
1.0000	-0.0048	0.0119	-0.0111
0.9923	0.0049	0.0169	-0.0145
0.9673	0.0133	0.0307	-0.0214
0.9649	0.0141	0.0412	-0.0251
0.9270	0.0254	0.0712	-0.0312
0.8751	0.0389	0.0936	-0.0337
0.8276	0.0503	0.1179	-0.0352
0.7791	0.0609	0.1392	-0.0361
0.7325	0.0700	0.1859	-0.0370
0.6791	0.0792	0.2256	-0.0374
0.6339	0.0862	0.2838	-0.0377
0.5801	0.0938	0.3352	-0.0375
0.5340	0.0995	0.3853	-0.0373
0.4928	0.1037	0.4375	-0.0365
0.4360	0.1082	0.4851	-0.0361
0.3880	0.1099	0.5327	-0.0352
0.3385	0.1095	0.5773	-0.0345
0.2859	0.1065	0.6283	-0.0331
0.2414	0.1022	0.6822	-0.0317
0.1939	0.0949	0.7283	-0.0302
0.1395	0.0826	0.7807	-0.0285
0.0924	0.0680	0.8238	-0.0267
0.0473	0.0500	0.8796	-0.0245
0.0210	0.0353	0.9048	-0.0233
0.0126	0.0291	0.9350	-0.0218
0.0033	0.0195	0.9680	-0.0196
0.0000	0.0097	0.9835	-0.0176
0.0000	0.0092	0.9923	-0.0164
0.0013	0.0020	1.0000	-0.0048
0.0052	-0.0048		

r/R = 0.707

x/c	y/c	x/c	y/c
1.0000	-0.0031	0.0049	-0.0098
0.9943	0.0133	0.0148	-0.0191
0.9665	0.0248	0.0267	-0.0266
0.9402	0.0331	0.0500	-0.0356
0.8950	0.0454	0.0532	-0.0363
0.8452	0.0577	0.0935	-0.0433
0.7918	0.0694	0.1168	-0.0453
0.7426	0.0793	0.1351	-0.0464
0.6938	0.0875	0.1867	-0.0476
0.6405	0.0951	0.2434	-0.0477
0.5952	0.1007	0.2895	-0.0473
0.5428	0.1065	0.3426	-0.0460
0.4961	0.1107	0.3927	-0.0451
0.4435	0.1140	0.4462	-0.0432
0.3900	0.1153	0.4872	-0.0422
0.3435	0.1146	0.5401	-0.0404
0.2918	0.1113	0.5944	-0.0384
0.2427	0.1059	0.6456	-0.0360
0.1948	0.0983	0.6892	-0.0338
0.1489	0.0881	0.7342	-0.0312
0.0988	0.0725	0.7857	-0.0281
0.0562	0.0552	0.8363	-0.0247
0.0423	0.0480	0.8865	-0.0217
0.0312	0.0416	0.9161	-0.0196
0.0230	0.0361	0.9477	-0.0169
0.0146	0.0297	0.9745	-0.0137
0.0038	0.0182	0.9823	-0.0145
0.0000	0.0088	1.0000	-0.0031
0.0004	-0.0020		

r/R = 0.856

x/c	y/c	x/c	y/c
1.0000	-0.0186	0.0000	-0.0109
0.9963	-0.0056	0.0004	-0.0024
0.9762	0.0034	0.0012	-0.0110
0.9588	0.0093	0.0035	-0.0153
0.9140	0.0221	0.0090	-0.0218
0.8724	0.0322	0.0311	-0.0305
0.8129	0.0449	0.0735	-0.0365
0.7647	0.0538	0.1002	-0.0380
0.7105	0.0626	0.1301	-0.0391
0.6684	0.0686	0.1664	-0.0399
0.6121	0.0757	0.2209	-0.0410
0.5664	0.0805	0.2728	-0.0419
0.4971	0.0851	0.3380	-0.0425
0.4417	0.0867	0.3914	-0.0429
0.3966	0.0868	0.4411	-0.0432
0.3522	0.0859	0.5009	-0.0436
0.2879	0.0828	0.5587	-0.0435
0.2450	0.0793	0.6177	-0.0425
0.1922	0.0728	0.6604	-0.0413
0.1464	0.0642	0.7173	-0.0391
0.0886	0.0491	0.7859	-0.0357
0.0396	0.0304	0.8325	-0.0327
0.0258	0.0234	0.8738	-0.0302
0.0175	0.0177	0.9241	-0.0278
0.0102	0.0121	0.9644	-0.0257
0.0045	0.0059	0.9870	-0.0226
0.0006	-0.0014	1.0000	-0.0186

r/R = 0.805

x/c	y/c	x/c	y/c
1.0000	0.0010	0.0032	-0.0037
0.9941	0.0102	0.0108	-0.0113
0.9731	0.0192	0.0149	-0.0146
0.9400	0.0292	0.0536	-0.0259
0.8932	0.0416	0.0913	-0.0294
0.8413	0.0539	0.1193	-0.0305
0.8021	0.0622	0.1470	-0.0310
0.7522	0.0717	0.2016	-0.0314
0.6983	0.0808	0.2474	-0.0315
0.6442	0.0889	0.2898	-0.0315
0.5923	0.0958	0.3464	-0.0312
0.5418	0.1014	0.3924	-0.0308
0.4990	0.1050	0.4480	-0.0303
0.4404	0.1078	0.4940	-0.0299
0.4041	0.1081	0.5353	-0.0294
0.3448	0.1063	0.5921	-0.0283
0.2963	0.1029	0.6518	-0.0265
0.2463	0.0978	0.6973	-0.0248
0.1905	0.0891	0.7637	-0.0216
0.1485	0.0796	0.8143	-0.0189
0.0956	0.0639	0.8664	-0.0161
0.0454	0.0438	0.9118	-0.0139
0.0383	0.0402	0.9481	-0.0119
0.0268	0.0337	0.9747	-0.0097
0.0128	0.0242	0.9885	-0.0074
0.0033	0.0147	0.9938	-0.0070
0.0000	0.0066	1.0000	0.0010
0.0001	0.0037		

r/R = 0.959

x/c	y/c	x/c	y/c
1.0000	-0.0081	0.0000	-0.0040
0.9940	0.0092	0.0037	-0.0087
0.9576	0.0247	0.0101	-0.0133
0.9167	0.0356	0.0351	-0.0195
0.8684	0.0452	0.0820	-0.0243
0.8258	0.0517	0.1111	-0.0261
0.7692	0.0587	0.1508	-0.0283
0.7094	0.0654	0.2061	-0.0302
0.6452	0.0715	0.2693	-0.0319
0.5937	0.0747	0.3452	-0.0333
0.5116	0.0767	0.4025	-0.0339
0.4363	0.0765	0.4523	-0.0342
0.3727	0.0751	0.5096	-0.0341
0.3077	0.0722	0.5737	-0.0335
0.2468	0.0683	0.6211	-0.0329
0.1901	0.0628	0.6791	-0.0318
0.1441	0.0570	0.7291	-0.0307
0.0940	0.0484	0.8097	-0.0277
0.0495	0.0363	0.8677	-0.0257
0.0373	0.0313	0.9107	-0.0246
0.0223	0.0238	0.9518	-0.0234
0.0076	0.0131	0.9646	-0.0218
0.0018	0.0049	0.9868	-0.0181
0.0001	-0.0031	1.0000	-0.0081

r/R = 0.906

x/c	y/c	x/c	y/c
1.0000	-0.0118	0.0000	-0.0042
0.9921	0.0045	0.0065	-0.0148
0.9788	0.0112	0.0100	-0.0181
0.9521	0.0205	0.0350	-0.0262
0.9078	0.0321	0.0812	-0.0313
0.8527	0.0441	0.1118	-0.0326
0.7998	0.0531	0.1571	-0.0338
0.7437	0.0610	0.1867	-0.0345
0.6985	0.0666	0.2621	-0.0366
0.6406	0.0732	0.3051	-0.0375
0.5824	0.0784	0.3498	-0.0382
0.5303	0.0809	0.4141	-0.0391
0.4579	0.0815	0.4516	-0.0393
0.3985	0.0806	0.5116	-0.0395
0.3410	0.0789	0.5663	-0.0392
0.2955	0.0771	0.6089	-0.0386
0.2448	0.0745	0.6628	-0.0375
0.1928	0.0703	0.6942	-0.0367
0.1321	0.0621	0.7681	-0.0343
0.0900	0.0532	0.8137	-0.0323
0.0569	0.0426	0.8593	-0.0300
0.0413	0.0358	0.9191	-0.0278
0.0273	0.0283	0.9435	-0.0275
0.0185	0.0226	0.9668	-0.0266
0.0064	0.0121	0.9806	-0.0249
0.0005	0.0012	0.9901	-0.0246
0.0001	-0.0033	1.0000	-0.0118

Appendix B

Pressure Blade Airfoil Coordinates

Nomenclature

COLL	collective angle at 0.75R, θ_c, deg
Cpl	lower surface pressure coefficient, C_P
Cpu	upper surface pressure coefficient, C_P
CQ/S	rotor torque coefficient over solidity, C_Q/σ
CT/S	rotor thrust coefficient over solidity, C_T/σ
DENSITY	air density, ρ, slugs/ft^3
PRESS	ambient pressure, P_∞, lb/in.^{2}
RPM	rotor rotation speed, rev/min
r/R	nondimensional rotor radius
TEMP	ambient air temperature, °F
THRUST	rotor thrust, lb
TORQUE	rotor torque, ft·lb
x/c	nondimensional chord location

COLL = 0   RPM = 400   THRUST = 3.52
 TORQUE = 0.66   CT/S = 0.1416   CQ/S = 0.0133
  PRESS = 14.756   TEMP = 62.22   DENSITY = 0.002363

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-0.6495	-0.4812	-0.8003
0.15	-2.2595	-1.4992	-1.2395
0.25	-3.3915	-1.6965	-1.3446
0.35	-3.2764	-1.5414	-1.3007
0.45	-2.4963	-1.2758	-1.0996
0.55	-1.4253	-1.0221	-0.8919
0.65	-1.0724	-0.5996	-0.7429
0.75	-1.1674	-0.4076	-0.3740
0.85	-0.9441	-0.2423	-0.1507
0.95	-0.8444	-0.072	0.0499

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-0.9516	-0.3282	-0.3908
0.15	-1.1217	-0.5131	-0.6071
0.30	-1.3703	-0.5791	-0.4864
0.40	****	****	-0.5495
0.50	-1.1121	-0.4109	-0.2511
0.70	-0.5612	-0.1271	-0.1344
0.80	-0.8565	-0.1066	-0.1147
0.90	-0.5703	0.0566	0.0522

COLL = 0
TORQUE = 0.99
PRESS = 14.756

RPM = 600
CT/S = 0.0946
TEMP = 62.17

THRUST = 5.30
CQ/S = 0.0088
DENSITY = 0.002363

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-0.6525	-0.4183	-0.7847
0.15	-2.4165	-1.4551	-1.1718
0.25	-3.2502	-1.6970	-1.3725
0.35	-3.1646	-1.5874	-1.2724
0.45	-2.5000	-1.3651	-1.0687
0.55	-1.3517	-1.0091	-0.8866
0.65	-1.1562	-0.5581	-0.6353
0.75	-1.1326	-0.4156	-0.2951
0.85	-1.1520	-0.2679	-0.1650
0.95	-0.8893	-0.0218	0.0504

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-1.0609	-0.4225	-0.4234
0.15	-1.1143	-0.5435	-0.6467
0.30	-1.3636	-0.6274	-0.5110
0.40	****	****	-0.4972
0.50	-1.0774	-0.4644	-0.2581
0.70	-0.7343	-0.1277	-0.1313
0.80	-0.9086	-0.0998	-0.0525
0.90	-0.6726	0.0505	0.0432

COLL = 0 RPM = 800 THRUST = 5.43
TORQUE = 1.28 CT/S = 0.0546 CQ/S = 0.0064
PRESS = 14.756 TEMP = 62.39 DENSITY = 0.002363

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-0.7720	-0.5964	-0.8753	-0.6802
0.15	-2.3731	-1.7157	-1.2331	-0.9496
0.25	-3.1938	-1.9471	-1.4282	-1.1096
0.35	-2.9967	-1.6974	-1.3043	-1.0180
0.45	-2.0054	-1.4100	-1.0640	-0.8754
0.55	-1.2619	-0.9386	-0.8448	-0.7476
0.65	-1.0351	-0.4435	-0.5782	-0.5264
0.75	-1.0308	-0.2868	-0.2819	-0.2671
0.85	-1.1887	-0.2004	-0.1330	-0.1964
0.95	-0.7900	0.0314	0.0566	0.0897

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-0.3011	-0.2360	-0.0931	0.1099
0.15	-0.7567	-0.6031	-0.4296	-0.3179
0.25	-0.8180	-0.6934	-0.5363	-0.4782
0.35	-0.8098	-0.7116	-0.5812	-0.5502
0.45	-0.6792	-0.6448	-0.5356	-0.5333
0.55	-0.5966	-0.5694	-0.4767	-0.4564
0.65	-0.5090	-0.4930	-0.4055	-0.3886
0.75	-0.3442	-0.3904	-0.3495	-0.3429
0.85	-0.1954	-0.2392	-0.2952	-0.2868
0.95	0.0442	0.0257	-0.0414	-0.0624

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.5781	-0.2719	-0.3591	-0.5079
0.15	-0.9102	-0.4040	-0.5875	-0.5824
0.30	-1.0610	-0.5226	-0.4706	-0.3812
0.40	****	****	-0.4530	-0.3359
0.50	-0.9337	-0.3831	-0.2308	-0.2152
0.70	-0.5929	-0.0861	-0.1208	-0.0497
0.80	-0.7991	-0.0471	-0.0404	-0.0219
0.90	-0.5395	0.0788	0.0467	0.0568

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	-0.4229	-0.6287	-0.5955	-0.5784
0.15	-0.4487	-0.5065	-0.4893	-0.4769
0.30	-0.3821	-0.2911	-0.2169	-0.1641
0.40	-0.3122	-0.2204	-0.1515	-0.1214
0.50	-0.1768	-0.1195	-0.1006	-0.0826
0.70	-0.0177	-0.0444	-0.0402	-0.0285
0.80	0.0020	-0.0240	-0.0045	0.0024
0.90	0.0576	0.0395	0.0458	0.0381

COLL = 0   RPM = 1200   THRUST = 8.65
TORQUE = 2.13   CT/S = 0.0386   CQ/S = 0.0048
PRESS = 14.756   TEMP = 62.32   DENSITY = 0.002363

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-0.8260	-0.5342	-0.9775	-0.7171
0.15	-2.5671	-1.5419	-1.3223	-0.9772
0.25	-3.3517	-1.8076	-1.5673	-1.1862
0.35	-3.2113	-1.5977	-1.4177	-1.0423
0.45	-1.9574	-1.3085	-1.1615	-0.8900
0.55	-1.2908	-0.7899	-0.9120	-0.7360
0.65	-1.0438	-0.4346	-0.5198	-0.4769
0.75	-1.0629	-0.3078	-0.2911	-0.2680
0.85	-1.0112	-0.1843	-0.1005	-0.1751
0.95	-0.7602	0.0194	0.1083	0.1238

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-0.2894	-0.2138	-0.0863	0.1254
0.15	-0.7454	-0.5748	-0.4441	-0.2904
0.25	-0.8104	-0.6516	-0.5387	-0.4843
0.35	-0.8157	-0.7063	-0.5912	-0.5583
0.45	-0.6538	-0.6433	-0.5448	-0.5309
0.55	-0.5715	-0.5279	-0.4724	-0.4307
0.65	-0.4389	-0.4253	-0.3828	-0.3310
0.75	-0.3201	-0.3441	-0.3239	-0.2884
0.85	-0.1982	-0.2127	-0.2596	-0.2399
0.95	0.0521	0.0541	-0.0339	-0.0409

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.4891	-0.2619	-0.3673	-0.4975
0.15	-0.6560	-0.3927	-0.6255	-0.5816
0.30	-0.9164	-0.5003	-0.4999	-0.3935
0.40	****	****	-0.4254	-0.3322
0.50	-0.8973	-0.3724	-0.2506	-0.2156
0.70	-0.5944	-0.0550	-0.0744	-0.0514
0.80	-0.7519	-0.0244	-0.0170	-0.0180
0.90	-0.5796	0.0750	0.0546	0.0489

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	-0.4185	-0.6381	-0.5916	-0.6209
0.15	-0.4521	-0.5152	-0.4900	-0.4982
0.30	-0.3867	-0.2959	-0.1885	-0.1669
0.40	-0.3074	-0.2074	-0.1493	-0.1229
0.50	-0.1878	-0.0902	-0.1002	-0.0772
0.70	-0.0197	-0.0507	-0.0396	-0.0292
0.80	0.0017	-0.0297	-0.0019	0.0071
0.90	0.0518	0.0284	0.0506	0.0363

COLL = 0   RPM = 1800   THRUST = 16.04
TORQUE = 3.83   CT/S = 0.0318   CQ/S = 0.0038
PRESS = 14.756   TEMP = 62.28   DENSITY = 0.002363

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-0.8540	-0.5554	-0.9261	-0.6983
0.15	-2.5262	-1.5363	-1.2485	-0.9589
0.25	-3.2047	-1.8248	-1.4810	-1.1087
0.35	-3.0929	-1.5824	-1.3474	-1.0342
0.45	-1.8019	-1.2963	-1.0978	-0.8084
0.55	-1.2430	-0.7333	-0.7829	-0.6513
0.65	-0.9972	-0.4156	-0.5018	-0.4460
0.75	-1.0554	-0.2949	-0.2612	-0.2301
0.85	-1.0302	-0.1454	-0.0891	-0.1078
0.95	-0.8710	0.0462	0.0923	0.1479

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-0.3220	-0.2019	-0.0756	0.1275
0.15	-0.7761	-0.5611	-0.4541	-0.2438
0.25	-0.8235	-0.6386	-0.5282	-0.6131
0.35	-0.7658	-0.6924	-0.5800	-0.5605
0.45	-0.6005	-0.5519	-0.5295	-0.5009
0.55	-0.5779	-0.4960	-0.4556	-0.4073
0.65	-0.4195	-0.4174	-0.3641	-0.3049
0.75	-0.2955	-0.3257	-0.3021	-0.2700
0.85	-0.1763	-0.1859	-0.2455	-0.2195
0.95	0.0829	0.0864	-0.0093	-0.0201

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.4385	-0.2237	-0.3715	-0.5067
0.15	-0.6915	-0.3653	-0.6190	-0.5895
0.30	-0.8957	-0.4760	-0.4943	-0.3960
0.40	****	****	-0.3925	-0.3237
0.50	-0.8316	-0.3435	-0.2425	-0.2097
0.70	-0.5454	-0.0173	-0.0628	-0.0587
0.80	-0.6771	-0.0083	-0.0160	-0.0245
0.90	-0.4855	0.0768	0.0477	0.0340

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	-0.3937	-0.6479	-0.5863	-0.6140
0.15	-0.4346	-0.5193	-0.4942	-0.4713
0.30	-0.3712	-0.2839	-0.1703	-0.1488
0.40	-0.2481	-0.1602	-0.1421	-0.1084
0.50	-0.1480	-0.0816	-0.0902	-0.0570
0.70	-0.0171	-0.0493	-0.0289	-0.0161
0.80	0.0100	-0.0277	0.0118	0.0269
0.90	0.0560	0.0251	0.0649	0.0507

COLL = 0   RPM = 2400   THRUST = 26.71
TORQUE = 6.37   CT/S = 0.0298   CQ/S = 0.0036
PRESS = 14.756   TEMP = 62.29   DENSITY = 0.002363

Cpu

r/R x/c	0.125	0.20	0.30	0.40
0.06	-0.8150	-0.5811	-0.9619	-0.6676
0.15	-2.4203	-1.5727	-1.3004	-0.9207
0.25	-3.0602	-1.8617	-1.3894	-1.0567
0.35	-2.9125	-1.6030	-1.3420	-0.9995
0.45	-1.7911	-1.1668	-1.0889	-0.7499
0.55	-1.1950	-0.7365	-0.7680	-0.6134
0.65	-0.9702	-0.4195	-0.4778	-0.4170
0.75	-1.0843	-0.2822	-0.2239	-0.2143
0.85	-1.0435	-0.1208	-0.0571	-0.0953
0.95	-0.7827	0.0713	0.0974	0.1519

r/R x/c	0.50	0.60	0.70	0.75
0.06	-0.2966	-0.1850	-0.0565	0.1272
0.15	-0.7303	-0.5411	-0.4331	-0.2231
0.25	-0.7981	-0.6139	-0.5004	-0.5598
0.35	-0.7359	-0.6559	-0.5586	-0.5258
0.45	-0.5757	-0.5238	-0.5051	-0.4669
0.55	-0.5526	-0.4681	-0.4268	-0.3672
0.65	-0.3986	-0.3824	-0.3370	-0.2740
0.75	-0.2739	-0.2810	-0.2744	-0.2307
0.85	-0.1526	-0.1236	-0.2170	-0.1797
0.95	0.1083	0.0989	0.0200	0.0142

Cpl

r/R x/c	0.125	0.20	0.30	0.40
0.10	-0.3345	-0.1860	-0.3499	-0.4837
0.15	-0.6098	-0.3371	-0.6197	-0.5666
0.30	-0.8031	-0.4448	-0.5001	-0.3799
0.40	****	****	-0.3791	-0.3097
0.50	-0.7898	-0.3293	-0.2385	-0.1712
0.70	-0.5206	-0.0011	-0.0654	-0.0544
0.80	-0.6717	0.0159	-0.0107	-0.0199
0.90	-0.5375	0.0884	0.0501	0.0353

r/R x/c	0.50	0.60	0.70	0.75
0.10	-0.3782	-0.6226	-0.5610	-0.5928
0.15	-0.4235	-0.5005	-0.4918	-0.3878
0.30	-0.3518	-0.2238	-0.1529	-0.1206
0.40	-0.2314	-0.1505	-0.1275	-0.0919
0.50	-0.1329	-0.0735	-0.0714	-0.0353
0.70	-0.0112	-0.0405	-0.0114	0.0053
0.80	0.0183	-0.0224	0.0302	0.0489
0.90	0.0612	0.0209	0.0793	0.0685

COLL = 4   RPM = 400   THRUST = 3.54
TORQUE = 0.77   CT/S = 0.1416   CQ/S = 0.0154
PRESS = 14.756   TEMP = 59.19   DENSITY = 0.002376

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-0.9120	-0.6163	-1.0859
0.15	-3.0905	-1.7879	-1.4252
0.25	-3.7900	-2.1028	-1.4447
0.35	-3.4111	-1.6706	-1.3977
0.45	-2.9788	-1.5432	-1.2321
0.55	-1.5084	-1.0331	-0.9829
0.65	-1.1233	-0.5971	-0.6880
0.75	-1.0075	-0.3345	-0.2986
0.85	-1.1877	-0.2708	-0.1836
0.95	-0.8165	-0.0116	0.0542

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-0.7033	-0.2453	-0.2318
0.15	-0.7604	-0.3805	-0.4262
0.30	-0.9581	-0.4697	-0.3988
0.40	****	****	-0.3731
0.50	-0.9762	-0.3290	-0.2023
0.70	-0.6370	-0.0995	-0.1031
0.80	-0.6366	-0.0070	-0.0873
0.90	-0.6205	0.0378	0.0591

COLL = 4   RPM = 600   THRUST = 5.40
TORQUE = 1.22   CT/S = 0.0959   CQ/S = 0.0108
PRESS = 14.756   TEMP = 59.41   DENSITY = 0.002375

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-1.0904	-0.8227	-1.2638
0.15	-2.7822	-1.9161	-1.5757
0.25	-3.5868	-2.1454	-1.6526
0.35	-3.4449	-1.8595	-1.5429
0.45	-2.6677	-1.5589	-1.2864
0.55	-1.4796	-0.9884	-1.0608
0.65	-1.2449	-0.5068	-0.6793
0.75	-1.2443	-0.2908	-0.3215
0.85	-1.1045	-0.2015	-0.1928
0.95	-0.9687	0.0544	0.0543

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-0.4888	-0.0240	-0.1931
0.15	-0.7615	-0.1267	-0.4104
0.30	-0.9369	-0.3024	-0.3960
0.40	****	-0.2854	-0.4123
0.50	-0.8568	-0.2210	-0.1868
0.70	-0.6127	-0.0183	-0.1145
0.80	-0.6812	0.0285	-0.0916
0.90	-0.5364	0.1240	0.0537

COLL = 4 RPM = 800 THRUST = 8.15
TORQUE = 1.50 CT/S = 0.0815 CQ/S = 0.0075
PRESS = 14.756 TEMP = 59.83 DENSITY = 0.002373

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-1.1377	-0.7225	-1.1623	-0.9496
0.15	-2.8314	-1.7448	-1.4101	-1.1165
0.25	-3.5660	-1.9944	-1.5250	-1.2595
0.35	-3.4967	-1.7395	-1.4381	-1.0905
0.45	-2.1849	-1.3951	-1.1832	-0.9145
0.55	-1.4239	-0.9279	-0.9607	-0.7681
0.65	-1.2160	-0.4928	-0.5688	-0.5192
0.75	-1.0616	-0.3464	-0.2978	-0.2668
0.85	-1.1578	-0.2190	-0.1730	-0.1640
0.95	-0.7279	0.0015	0.0767	0.0921

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-0.6040	-0.4609	-0.3056	-0.0982
0.15	-0.9700	-0.7592	-0.5999	-0.3653
0.25	-0.9908	-0.8112	-0.6630	-0.6987
0.35	-0.9503	-0.7965	-0.6873	-0.6426
0.45	-0.7905	-0.6891	-0.6127	-0.5915
0.55	-0.6752	-0.6018	-0.5183	-0.4769
0.65	-0.5262	-0.5345	-0.4441	-0.3777
0.75	-0.3284	-0.4592	-0.3819	-0.3113
0.85	-0.2018	-0.2359	-0.2713	-0.2483
0.95	0.0615	0.0280	-0.0249	-0.0405

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.3007	-0.1171	-0.1773	-0.2570
0.15	-0.2535	-0.2561	-0.3715	-0.3701
0.30	-0.6325	-0.4030	-0.3607	-0.2506
0.40	****	-0.4438	-0.3898	-0.2090
0.50	-0.6712	-0.3221	-0.1704	-0.1298
0.70	-0.5206	-0.0720	-0.0963	-0.0459
0.80	-0.5582	-0.0102	-0.0603	-0.0079
0.90	-0.4200	0.0865	0.0763	0.0569

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	-0.2000	-0.4055	-0.4090	-0.4329
0.15	-0.2721	-0.3366	-0.3430	-0.3216
0.30	-0.2767	-0.1798	-0.1544	-0.1471
0.40	-0.2125	-0.1455	-0.1215	-0.1197
0.50	-0.1094	-0.0810	-0.0728	-0.0647
0.70	-0.0139	-0.0169	-0.0209	-0.0084
0.80	0.0106	-0.0009	0.0149	0.0179
0.90	0.0703	0.0554	0.0606	0.0382

COLL = 4   RPM = 1200   THRUST = 15.21
TORQUE = 2.82   CT/S = 0.0677   CQ/S = 0.0063
PRESS = 14.756   TEMP = 60.19   DENSITY = 0.002371

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-1.0174	-0.6947	-1.1631	-0.9461
0.15	-2.7220	-1.6609	-1.4241	-1.1113
0.25	-3.4009	-1.9000	-1.5974	-1.2691
0.35	-3.2554	-1.6428	-1.4449	-1.0877
0.45	-1.9812	-1.3909	-1.1740	-0.9187
0.55	-1.3700	-0.8206	-0.8622	-0.7078
0.65	-1.1237	-0.4714	-0.5234	-0.4734
0.75	-1.0764	-0.3484	-0.2876	-0.2517
0.85	-1.0968	-0.1775	-0.1273	-0.1285
0.95	-0.8744	0.0321	0.0793	0.1177

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-0.5765	-0.4430	-0.2998	-0.0922
0.15	-0.9400	-0.7329	-0.6043	-0.3648
0.25	-0.9554	-0.7967	-0.6618	-0.7165
0.35	-0.9113	-0.7844	-0.6841	-0.6622
0.45	-0.7378	-0.6762	-0.6051	-0.5833
0.55	-0.6105	-0.5861	-0.5157	-0.4629
0.65	-0.4542	-0.5104	-0.4074	-0.3429
0.75	-0.3104	-0.3636	-0.3286	-0.2892
0.85	-0.1750	-0.2239	-0.2560	-0.2300
0.95	0.0852	0.0476	-0.0181	-0.0226

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.3184	-0.1195	-0.1719	-0.2640
0.15	-0.4876	-0.2534	-0.3935	-0.3757
0.30	-0.7216	-0.3867	-0.3627	-0.2700
0.40	****	-0.4092	-0.3381	-0.2198
0.50	-0.6757	-0.2903	-0.1782	-0.1387
0.70	-0.4775	-0.0410	-0.0929	-0.0533
0.80	-0.6166	0.0138	-0.0218	-0.0081
0.90	-0.5485	0.0961	0.0641	0.0538

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	-0.1918	-0.4057	-0.4163	-0.4339
0.15	-0.2664	-0.3339	-0.3523	-0.3203
0.30	-0.2706	-0.1832	-0.1564	-0.1473
0.40	-0.2108	-0.1420	-0.1207	-0.0781
0.50	-0.1133	-0.0841	-0.0617	-0.0344
0.70	-0.0045	-0.0230	-0.0128	-0.0065
0.80	0.0200	0.0036	0.0214	0.0283
0.90	0.0638	0.0555	0.0641	0.0433

COLL = 4 RPM = 1800 THRUST = 30.27
TORQUE = 5.66 CT/S = 0.0598 CQ/S = 0.0056
PRESS = 14.756 TEMP = 59.71 DENSITY = 0.002372

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-0.9713	-0.6955	-1.1462	-0.9197
0.15	-2.6746	-1.6997	-1.3764	-1.0875
0.25	-3.4166	-1.9419	-1.4730	-1.1973
0.35	-3.1625	-1.7024	-1.3931	-1.0791
0.45	-1.9424	-1.3493	-1.1173	-0.8390
0.55	-1.2198	-0.8027	-0.7895	-0.6523
0.65	-1.0897	-0.4522	-0.5016	-0.4367
0.75	-1.0529	-0.3215	-0.2602	-0.2078
0.85	-1.0458	-0.1581	-0.1186	-0.0674
0.95	-0.877	0.0396	0.0759	0.1393

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-0.5599	-0.4263	-0.2772	-0.0726
0.15	-0.9257	-0.7136	-0.5981	-0.3605
0.25	-0.9227	-0.7628	-0.6376	-0.7028
0.35	-0.8321	-0.7596	-0.6583	-0.6883
0.45	-0.6352	-0.5894	-0.5799	-0.5568
0.55	-0.5873	-0.5251	-0.4891	-0.4412
0.65	-0.4191	-0.4268	-0.3782	-0.3310
0.75	-0.2801	-0.3407	-0.3029	-0.2632
0.85	-0.1453	-0.1992	-0.2404	-0.2017
0.95	0.1109	0.0894	0.0054	0.0055

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.3756	-0.1055	-0.1775	-0.2792
0.15	-0.5812	-0.2305	-0.4236	-0.3901
0.30	-0.7821	-0.3781	-0.3800	-0.2797
0.40	****	-0.3987	-0.3065	-0.2227
0.50	-0.7619	-0.2856	-0.1787	-0.1481
0.70	-0.5237	-0.0092	-0.0616	-0.0447
0.80	-0.6587	0.0165	-0.0063	-0.0016
0.90	-0.5112	0.0808	0.0507	0.0386

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	-0.1860	-0.4119	-0.3987	-0.4230
0.15	-0.2599	-0.3410	-0.3452	-0.3125
0.30	-0.2685	-0.1809	-0.1081	-0.0806
0.40	-0.2058	-0.1369	-0.0904	-0.0559
0.50	-0.0944	-0.0590	-0.0490	-0.0175
0.70	0.0029	-0.0109	-0.0046	0.0045
0.80	0.0249	0.0036	0.0306	0.0456
0.90	0.0572	0.0498	0.0738	0.0538

COLL = 4   RPM = 2400   THRUST = 51.09
TORQUE = 10.04   CT/S = 0.0568   CQ/S = 0.0056
PRESS = 14.756   TEMP = 59.24   DENSITY = 0.002375

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-0.9754	-0.6713	-1.0954	-0.8988
0.15	-2.7090	-1.6253	-1.3376	-1.0677
0.25	-3.4447	-1.9307	-1.4064	-1.1653
0.35	-3.1791	-1.6753	-1.3257	-1.0656
0.45	-1.9712	-1.2265	-1.0688	-0.7937
0.55	-1.3218	-0.7929	-0.7548	-0.6241
0.65	-1.0525	-0.4590	-0.4820	-0.4161
0.75	-1.0920	-0.3097	-0.2423	-0.1996
0.85	-1.0582	-0.1551	-0.1060	-0.0567
0.95	-0.8749	0.0471	0.0598	0.1446

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-0.5362	-0.4036	-0.2480	-0.0466
0.15	-0.8740	-0.7000	-0.5720	-0.3580
0.25	-0.8995	-0.7374	-0.6056	-0.6827
0.35	-0.8049	-0.7383	-0.6358	-0.6415
0.45	-0.6132	-0.5701	-0.5544	-0.5296
0.55	-0.5614	-0.5030	-0.4573	-0.4077
0.65	-0.3957	-0.4050	-0.3520	-0.3059
0.75	-0.2600	-0.3078	-0.2779	-0.2361
0.85	-0.1225	-0.1569	-0.2112	-0.1715
0.95	0.1323	0.1212	0.0341	0.0333

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.2645	-0.0921	-0.1859	-0.2711
0.15	-0.5892	-0.2505	-0.4310	-0.3842
0.30	-0.7229	-0.3778	-0.3820	-0.2713
0.40	****	-0.3865	-0.2975	-0.2090
0.50	-0.7062	-0.2873	-0.1825	-0.1430
0.70	-0.5176	0.0023	-0.0487	-0.0237
0.80	-0.6194	0.0143	-0.0072	0.0045
0.90	-0.5342	0.0800	0.0454	0.0370

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	-0.1807	-0.4090	-0.3820	-0.4043
0.15	-0.2572	-0.3363	-0.3492	-0.2996
0.30	-0.2470	-0.1748	-0.0871	-0.0554
0.40	-0.1525	-0.0993	-0.0739	-0.0444
0.50	-0.0883	-0.0215	-0.0327	-0.0022
0.70	0.0131	-0.0074	0.0108	0.0236
0.80	0.0380	0.0049	0.0471	0.0647
0.90	0.0628	0.0455	0.0859	0.0714

COLL = 8   RPM = 400   THRUST = 4.75
TORQUE = 1.12   CT/S = 0.1925   CQ/S = 0.0227
PRESS = 14.718   TEMP = 64.75   DENSITY = 0.002343

Cpu

x/c \ r/R	0.125	0.20	0.30
0.06	-1.4032	-0.9129	-1.5430
0.15	-3.4942	-1.9267	-1.6584
0.25	-4.7281	-2.2552	-1.6298
0.35	-3.9359	-1.7702	-1.4408
0.45	-3.0945	-1.5061	-1.2632
0.55	-1.7761	-1.1667	-1.0086
0.65	-1.6629	-0.5545	-0.7441
0.75	-1.1935	-0.2898	-0.3697
0.85	****	-0.1898	-0.2224
0.95	-0.7374	-0.0552	-0.0285

Cpl

x/c \ r/R	0.125	0.20	0.30
0.10	-0.3930	0.1145	0.0915
0.15	-0.5053	-0.0170	-0.1715
0.30	-0.7126	-0.1929	-0.1953
0.40	****	****	-0.1408
0.50	-0.6396	-0.1823	-0.0927
0.70	-0.5094	-0.0144	-0.0116
0.80	-0.6403	0.0710	-0.0023
0.90	-0.5979	0.0516	0.0398

COLL = 8   RPM = 600   THRUST = 7.82
TORQUE =1.93   CT/S = 0.1409   CQ/S = 0.0174
PRESS = 14.718   TEMP = 64.66   DENSITY = 0.002343

Cpu

x/c \ r/R	0.125	0.20	0.30
0.06	-1.4635	-1.1502	-1.4548
0.15	-3.4158	-2.1598	-1.7333
0.25	-4.1058	-2.3471	-1.6791
0.35	-4.0444	-1.8291	-1.4956
0.45	-3.0682	-1.5903	-1.2527
0.55	-1.8300	-0.9438	-1.0370
0.65	-1.5501	-0.5485	-0.5962
0.75	-1.4814	-0.3527	-0.3300
0.85	****	-0.2034	-0.1652
0.95	-0.8367	0.0085	-0.0002

Cpl

x/c \ r/R	0.125	0.20	0.30
0.10	-0.2988	0.2600	0.0942
0.15	-0.3206	0.0309	-0.1623
0.30	-0.5923	-0.1339	-0.1980
0.40	****	****	-0.1450
0.50	-0.4513	-0.1196	-0.0815
0.70	-0.5653	0.0294	-0.0063
0.80	-0.6633	0.0791	0.0105
0.90	-0.4885	0.1081	0.0483

COLL = 8   RPM = 800   THRUST = 12.65
TORQUE = 2.63   CT/S = 0.1292   CQ/S = 0.0134
PRESS = 14.718   TEMP = 68.66   DENSITY = 0.002324

Cpu

r/R x/c	0.125	0.20	0.30	0.40
0.06	-1.6303	-1.1863	-1.5897	-1.3187
0.15	-3.4085	-2.1927	-1.7236	-1.3367
0.25	-4.0958	-2.2975	-1.7513	-1.3879
0.35	-4.0132	-1.9788	-1.5482	-1.1673
0.45	-2.7973	-1.7078	-1.3160	-0.9961
0.55	-1.7371	-0.9273	-1.0622	-0.8647
0.65	-1.4780	-0.5257	-0.5557	-0.4865
0.75	-1.3764	-0.3427	-0.3207	-0.2860
0.85	****	-0.1892	-0.1553	-0.1727
0.95	-0.9942	0.0301	0.0326	0.0478

r/R x/c	0.50	0.60	0.70	0.75
0.06	-1.0305	-0.8390	-0.6776	-0.4859
0.15	-1.2554	-1.0207	-0.8585	-0.6375
0.25	-1.1760	-0.9872	-0.8412	-0.8237
0.35	-1.0506	-0.9179	-0.8182	-0.7874
0.45	-0.9223	-0.7958	-0.7203	-0.7003
0.55	-0.7267	-0.7044	-0.6176	-0.5535
0.65	-0.4972	-0.5554	-0.4987	-0.4289
0.75	-0.3587	-0.4004	-0.3425	-0.3318
0.85	-0.2248	-0.2680	-0.2780	-0.2617
0.95	0.0410	0.0067	-0.0342	-0.0428

Cpl

r/R x/c	0.125	0.20	0.30	0.40
0.10	-0.2479	0.2154	0.1015	0.0269
0.15	-0.3227	0.0640	-0.1601	-0.1169
0.30	-0.5767	-0.1267	-0.2022	-0.1085
0.40	****	-0.0511	-0.1577	-0.1653
0.50	-0.5633	-0.1383	-0.0728	-0.0275
0.70	-0.5809	0.0606	-0.0006	0.0434
0.80	-0.6597	0.0941	0.0138	0.0383
0.90	-0.5353	0.1047	0.0549	0.0802

r/R x/c	0.50	0.60	0.70	0.75
0.10	0.0817	-0.1168	-0.1343	-0.1547
0.15	-0.0326	-0.1096	-0.1258	-0.1064
0.30	-0.1270	-0.0515	-0.0291	-0.0195
0.40	-0.1912	-0.0497	-0.0245	-0.0111
0.50	-0.0073	0.0000	0.0030	0.0056
0.70	0.0616	0.0342	0.0286	0.0282
0.80	0.0527	0.0474	0.0514	0.0408
0.90	0.0992	0.0905	0.0809	0.0662

COLL = 8   RPM = 1200   THRUST = 24.39
TORQUE = 5.13   CT/S = 0.1109   CQ/S = 0.0117
PRESS = 14.718   TEMP = 69.49   DENSITY = 0.002321

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-1.4903	-1.1026	-1.5227	-1.2953
0.15	-3.2669	-2.1207	-1.6602	-1.3254
0.25	-3.9446	-2.3042	-1.7543	-1.4024
0.35	-3.8785	-1.9281	-1.5066	-1.1677
0.45	-2.3780	-1.5893	-1.2661	-0.9993
0.55	-1.6877	-0.8699	-0.9103	-0.7208
0.65	-1.4419	-0.5007	-0.5269	-0.4762
0.75	-1.4092	-0.3586	-0.2983	-0.2715
0.85	****	-0.1694	-0.1365	-0.1391
0.95	-1.1435	0.0302	0.05	0.0664

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-0.9935	-0.8272	-0.6566	-0.4777
0.15	-1.2161	-1.0117	-0.8564	-0.6379
0.25	-1.1521	-0.9882	-0.8365	-0.8211
0.35	-1.0467	-0.9202	-0.8093	-0.7747
0.45	-0.8695	-0.7906	-0.6965	-0.6858
0.55	-0.6634	-0.6620	-0.5773	-0.5358
0.65	-0.4811	-0.4886	-0.4373	-0.3989
0.75	-0.3386	-0.3923	-0.3441	-0.3180
0.85	-0.2032	-0.2458	-0.2722	-0.2466
0.95	0.0555	0.0364	-0.0272	-0.0349

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.3353	0.2024	0.0840	0.0134
0.15	-0.5408	0.0119	-0.1693	-0.1340
0.30	-0.7495	-0.1728	-0.1992	-0.1288
0.40	****	-0.1282	-0.1462	-0.1279
0.50	-0.7595	-0.1709	-0.0807	-0.0406
0.70	-0.5982	0.0537	-0.0105	0.0198
0.80	-0.7493	0.0947	-0.0002	0.0259
0.90	-0.6556	0.1134	0.0653	0.0625

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.0817	-0.1176	-0.1293	-0.1530
0.15	-0.0355	-0.1121	-0.1232	-0.1053
0.30	-0.1250	-0.0518	-0.0248	-0.0168
0.40	-0.1353	-0.0416	-0.0176	-0.0042
0.50	-0.0123	0.0009	0.0067	0.0078
0.70	0.0455	0.0309	0.0322	0.0275
0.80	0.0477	0.0414	0.0542	0.0397
0.90	0.0884	0.0775	0.0849	0.0639

COLL = 8   RPM = 1800   THRUST = 50.10
TORQUE = 10.30 CT/S = 0.1014 CQ/S = 0.0104
PRESS = 14.718 TEMP = 70.221 DENSITY = 0.002317

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-1.3527	-0.9199	-1.4796	-1.2605
0.15	-3.2964	-1.8883	-1.6156	-1.2914
0.25	-3.8506	-2.1263	-1.7700	-1.3340
0.35	-3.5295	-1.7517	-1.4969	-1.1459
0.45	-2.1616	-1.4309	-1.2020	-0.8892
0.55	-1.5420	-0.8057	-0.8036	-0.6688
0.65	-1.2693	-0.4879	-0.5028	-0.4408
0.75	-1.3715	-0.3498	-0.2680	-0.2181
0.85	****	-0.1876	-0.1231	-0.0719
0.95	-1.0412	0.0065	0.0492	0.081

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-0.9527	-0.7788	-0.6303	-0.4311
0.15	-1.1605	-0.9531	-0.8539	-0.5683
0.25	-1.0903	-0.9076	-0.8132	-0.8757
0.35	-0.9485	-0.8540	-0.7899	-0.7877
0.45	-0.7170	-0.6747	-0.6755	-0.6353
0.55	-0.6279	-0.5792	-0.5452	-0.4926
0.65	-0.4407	-0.4435	-0.4118	-0.3587
0.75	-0.2923	-0.2846	-0.3245	-0.2787
0.85	-0.1443	-0.1556	-0.2444	-0.2059
0.95	0.0935	0.0270	0.0078	0.0038

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.3652	0.0687	0.0603	-0.0018
0.15	-0.6092	-0.1052	-0.1936	-0.1504
0.30	-0.7219	-0.2491	-0.2208	-0.1389
0.40	****	-0.2271	-0.1415	-0.1111
0.50	-0.7150	-0.1994	-0.0921	-0.0510
0.70	-0.4912	0.0180	-0.0227	0.0063
0.80	-0.6454	0.0373	0.0211	0.0142
0.90	-0.6019	0.0763	0.0673	0.0432

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.0724	-0.1284	-0.1301	-0.1495
0.15	-0.0416	-0.1235	-0.1345	-0.1007
0.30	-0.1317	-0.0569	0.0058	-0.0096
0.40	-0.1152	-0.0380	0.0010	0.0097
0.50	-0.0234	-0.0043	0.0202	0.0559
0.70	0.0434	0.0171	0.0355	0.0478
0.80	0.0460	0.0200	0.0587	0.0846
0.90	0.0707	0.0490	0.0904	0.0731

COLL = 8   RPM = 2400   THRUST = 86.58
TORQUE = 18.36   CT/S = 0.0987   CQ/S = 0.0105
PRESS = 14.718   TEMP = 70.77   DENSITY = 0.002315

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-1.2922	-0.9100	-1.4038	-1.2046
0.15	-3.3036	-1.8667	-1.5514	-1.2460
0.25	-3.8646	-2.0954	-1.5946	-1.2880
0.35	-3.6220	-1.7655	-1.4074	-1.1269
0.45	-2.2009	-1.2941	-1.1281	-0.8411
0.55	-1.4465	-0.8223	-0.7657	-0.6370
0.65	-1.2117	-0.4896	-0.4811	-0.4168
0.75	-1.2912	-0.3207	-0.2388	-0.1995
0.85	****	-0.1787	-0.1202	-0.0546
0.95	-1.0208	0.0029	0.0385	0.0905

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-0.9102	-0.7256	-0.5801	-0.3892
0.15	-1.0970	-0.8988	-0.8082	-0.5781
0.25	-1.0547	-0.8373	-0.7667	-0.8342
0.35	-0.9102	-0.7689	-0.7510	-0.7573
0.45	-0.6789	-0.6592	-0.6351	-0.6113
0.55	-0.5960	-0.5794	-0.5012	-0.4578
0.65	-0.4122	-0.4014	-0.3784	-0.3356
0.75	-0.2557	-0.2424	-0.2888	-0.2458
0.85	-0.0991	-0.0775	-0.2054	-0.1658
0.95	0.1173	0.0611	0.0468	0.0377

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.4582	0.0441	0.0334	-0.0122
0.15	-0.6476	-0.1353	-0.2280	-0.1580
0.30	-0.7360	-0.2762	-0.2328	-0.1429
0.40	-0.7610	-0.2373	-0.1512	-0.1053
0.50	-0.7940	-0.2255	-0.0972	-0.0548
0.70	-0.6155	0.0122	-0.0083	0.0014
0.80	-0.7282	0.0388	0.0306	0.0153
0.90	-0.5821	0.0645	0.0613	0.0372

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.0675	-0.1303	-0.1216	-0.1348
0.15	-0.0496	-0.1224	-0.1420	-0.0873
0.30	-0.1148	-0.0540	0.0244	0.0075
0.40	-0.0651	-0.0343	0.0115	0.0461
0.50	-0.0140	-0.0008	0.0316	0.0724
0.70	0.0475	0.0290	0.0475	0.0648
0.80	0.0529	0.0258	0.0728	0.1008
0.90	0.0644	0.0472	0.0983	0.0858

COLL = 12   RPM = 1200   THRUST = 29.18
TORQUE = 7.17   CT/S = 0.1323   CQ/S = 0.0163
PRESS = 14.698   TEMP = 67.45   DENSITY = 0.002327

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-1.5000	-0.9423	-1.6367	-1.3926
0.15	-3.2663	-2.0101	-1.7645	-1.3834
0.25	-3.9911	-2.2172	-1.8739	-1.4543
0.35	-3.6817	-1.8857	-1.5872	-1.2207
0.45	-2.4034	-1.5207	-1.3145	-1.0000
0.55	-1.5696	-0.8723	-0.9092	-0.7390
0.65	-1.3099	-0.5027	-0.5324	-0.4962
0.75	-1.3116	-0.3885	-0.3152	-0.2881
0.85	****	****	****	****
0.95	-0.951	0.0073	0.053	0.0658

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-1.1072	****	****	****
0.15	-1.3003	****	****	-0.5237
0.25	-1.2061	-0.7227	-0.5776	-0.6492
0.35	-1.0885	-0.8845	-0.7713	-0.8292
0.45	-0.8280	-0.9767	-0.8442	-0.8263
0.55	-0.6886	-0.8333	-0.7409	-0.6228
0.65	-0.4951	-0.5943	-0.5753	-0.4976
0.75	-0.3610	-0.6203	-0.5701	-0.4554
0.85	****	-0.4262	-0.3658	****
0.95	0.0646	-0.2870	-0.2486	****

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.2315	0.1453	0.1168	0.0472
0.15	-0.4918	-0.0013	-0.1441	-0.1039
0.30	-0.6425	-0.2079	-0.1959	-0.1110
0.40	-0.6554	-0.3028	-0.1582	-0.0877
0.50	-0.6406	-0.2020	-0.0729	-0.0303
0.70	-0.3961	0.0570	0.0052	0.0239
0.80	-0.5464	0.0481	0.0106	0.0333
0.90	-0.4889	0.0841	0.0735	0.0702

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.1315	****	****	-0.0065
0.15	0.0007	0.1337	0.0825	0.0231
0.30	-0.1010	0.0621	0.0563	0.0012
0.40	-0.0686	****	****	****
0.50	-0.0060	0.0240	0.0517	****
0.70	0.0496	0.0950	0.1015	****
0.80	0.0553	****	****	****
0.90	0.0930	0.0991	0.0939	0.4094

COLL = 12   RPM = 1800   THRUST = 63.78
TORQUE = 15.01   CT/S = 0.1287   CQ/S = 0.0151
PRESS = 14.698   TEMP = 67.94   DENSITY = 0.002325

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-1.4609	-1.0716	-1.5806	-1.2858
0.15	-3.3010	-2.1262	-1.7099	-1.2984
0.25	-4.0575	-2.3222	-1.7874	-1.3172
0.35	-3.6455	-1.9184	-1.5665	-1.1581
0.45	-2.1855	-1.4085	-1.2439	-0.8952
0.55	-1.4635	-0.8528	-0.8483	-0.6806
0.65	-1.2313	-0.5113	-0.5224	-0.4543
0.75	-1.2887	-0.3701	-0.2960	-0.2529
0.85	****	****	****	****
0.95	-0.9465	0.0479	0.0583	0.0683

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-1.0046	****	****	****
0.15	-1.1629	****	****	-0.4968
0.25	-1.0859	-0.6864	-0.5370	-0.6338
0.35	-0.9437	-0.8347	-0.7541	-0.7808
0.45	-0.7128	-0.9267	-0.8154	-0.7929
0.55	-0.6238	-0.8168	-0.7191	-0.6016
0.65	-0.4420	-0.5678	-0.5467	-0.4674
0.75	-0.3065	-0.5877	-0.5329	-0.4093
0.85	****	-0.3974	-0.3377	****
0.95	0.0859	-0.2623	-0.2252	****

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.2993	0.1753	0.0681	0.0026
0.15	-0.5211	-0.0069	-0.2012	-0.1437
0.30	-0.6541	-0.1678	-0.2371	-0.1304
0.40	-0.7028	-0.2109	-0.1801	-0.1068
0.50	-0.6109	-0.1163	-0.0923	-0.0475
0.70	-0.4421	0.0931	-0.0242	0.0011
0.80	-0.5810	0.0728	0.0288	0.0139
0.90	-0.5656	0.1200	0.0700	0.0459

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.1112	****	****	0.0189
0.15	-0.0109	0.1635	0.1197	0.0303
0.30	-0.1079	0.0455	0.0476	0.0079
0.40	-0.0677	****	****	****
0.50	-0.0035	0.0143	0.0781	****
0.70	0.0482	0.0882	0.1228	****
0.80	0.0510	0.2090	0.2964	****
0.90	0.0698	0.0916	0.0992	0.4246

COLL = 16   RPM = 400   THRUST = 5.95
TORQUE = 1.59 CT/S = 0.2440 CQ/S = 0.0325
PRESS = 14.698 TEMP = 70.10 DENSITY = 0.002315

Cpu

x/c \ r/R	0.125	0.20	0.30
0.06	-2.6250	-1.6003	-2.6046
0.15	-4.4136	-2.8923	-2.5312
0.25	-5.1600	-2.9474	-2.1447
0.35	-4.6344	-2.3689	-1.8691
0.45	-3.6251	-1.9854	-1.6418
0.55	-2.3999	-1.1271	-1.1720
0.65	-1.7080	-0.7997	-0.5509
0.75	-1.7034	-0.5630	-0.3366
0.85	-1.4826	-0.4349	-0.2106
0.95	-1.1033	-0.1506	-0.0411

Cpl

x/c \ r/R	0.125	0.20	0.30
0.10	0.1418	0.4434	0.5413
0.15	-0.0694	0.2354	0.2475
0.30	-0.3562	-0.1473	0.0413
0.40	****	****	-0.0505
0.50	-0.4949	-0.1968	0.0205
0.70	-0.3163	-0.0509	0.0507
0.80	-0.5864	-0.0444	0.0340
0.90	-0.5461	0.0112	0.0500

COLL = 16   RPM = 600   THRUST = 13.29
TORQUE = 3.23 CT/S = 0.2423 CQ/S = 0.0294
PRESS = 14.698 TEMP = 70.11 DENSITY = 0.002315

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-2.6938	-2.0966	-2.6194
0.15	-4.6713	-3.0975	-2.4313
0.25	-4.7520	-2.7604	-2.1541
0.35	-4.7590	-2.5520	-1.9141
0.45	-3.1151	-1.9970	-1.6183
0.55	-2.1063	-1.0845	-0.9956
0.65	-1.6882	-0.6881	-0.5788
0.75	-1.7687	-0.5268	-0.3717
0.85	-1.6538	-0.3510	-0.2178
0.95	-1.0414	-0.082	-0.001

Cpl

r/R x/c	0.125	0.20	0.30
0.10	0.2260	0.4717	0.5786
0.15	-0.2303	0.3848	0.3166
0.30	-0.4782	0.0678	0.0637
0.40	****	****	-0.0501
0.50	-0.5054	-0.0061	0.0736
0.70	-0.4013	0.0839	0.0713
0.80	-0.7042	0.0528	0.0474
0.90	-0.5675	0.1065	0.0741

COLL = 16　　　　　　RPM = 800　　　　　THRUST = 22.11
TORQUE = 4.79　　　　CT/S = 0.2267　　　CQ/S = 0.0246
PRESS = 14.698　　　TEMP = 70.11　　　DENSITY = 0.002315

Cpu

r/R \ x/c	0.125	0.20	0.30
0.06	-2.4394	-1.9866	-2.4972
0.15	-4.4338	-2.7741	-2.2889
0.25	-5.3673	-2.7349	-2.1661
0.35	-4.9304	-2.4983	-1.8123
0.45	-3.2322	-1.7404	-1.5022
0.55	-2.0817	-1.0022	-0.9375
0.65	-1.7370	-0.6468	-0.5696
0.75	-1.6555	-0.5102	-0.3616
0.85	-1.5644	-0.3304	-0.2096
0.95	-1.0449	-0.0251	-0.0158

Cpl

r/R \ x/c	0.125	0.20	0.30
0.10	-0.0286	0.5160	0.5263
0.15	-0.3447	0.3621	0.2674
0.30	-0.5667	0.0730	0.0645
0.40	****	****	-0.0384
0.50	-0.5499	0.0027	0.0544
0.70	-0.4803	0.0858	0.0633
0.80	-0.6783	0.0682	0.0572
0.90	-0.5899	0.1157	0.0907

COLL = 16   RPM = 1200   THRUST = 39.61
TORQUE = 10.54   CT/S = 0.1802   CQ/S = 0.0240
PRESS = 14.698   TEMP = 69.26   DENSITY = 0.002319

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-2.3016	-1.8317	-2.5159	-2.1910
0.15	-4.4494	-2.8923	-2.3652	-1.8727
0.25	-5.1567	-2.9293	-2.2399	-1.7356
0.35	-4.6550	-2.4429	-1.8422	-1.4903
0.45	-3.1012	-1.8071	-1.6287	-1.0437
0.55	-2.0692	-1.0461	-0.9274	-0.7471
0.65	-1.7017	-0.6625	-0.5774	-0.5024
0.75	-1.6668	-0.5141	-0.3380	-0.2769
0.85	-1.6097	-0.3074	-0.1701	-0.1323
0.95	-1.5929	-0.0494	0.0151	0.0114

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-1.9424	-1.7203	-1.5756	-1.5365
0.15	-1.7418	-1.5698	-1.4338	-1.1920
0.25	-1.4995	-1.3488	-1.2148	-1.1652
0.35	-1.3305	-1.1481	-1.0770	-1.0583
0.45	-0.8279	-0.8341	-0.8487	-0.8397
0.55	-0.7151	-0.6719	-0.6461	-0.6284
0.65	-0.4896	-0.5084	-0.4815	-0.4405
0.75	-0.3119	-0.3634	-0.3619	-0.3383
0.85	-0.1304	-0.1623	-0.2207	-0.2201
0.95	0.0453	0.0530	0.0227	-0.0206

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.3278	0.4316	0.4930	0.4192
0.15	-0.7074	0.2839	0.2335	0.2390
0.30	-0.9577	0.0122	0.0590	0.0935
0.40	-1.0671	-0.1435	0.0061	0.0608
0.50	-0.8262	-0.0094	0.0573	0.0853
0.70	-0.5867	0.0640	0.0835	0.0724
0.80	-0.7269	0.0461	0.0611	0.0535
0.90	-0.7093	0.0778	0.0846	0.0530

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.5025	0.3834	0.3683	0.3638
0.15	0.3354	0.2852	0.2917	0.3037
0.30	0.1238	0.1820	0.2116	0.2204
0.40	0.0853	0.1343	0.1580	0.1638
0.50	0.1136	0.1374	0.1459	0.1487
0.70	0.0998	0.0891	0.0974	0.1035
0.80	0.0787	0.0632	0.0848	0.0796
0.90	0.0739	0.0657	0.0809	0.0731

COLL = 16   RPM = 1800   THRUST = 85.40
TORQUE = 23.25   CT/S = 0.1728   CQ/S = 0.0235
PRESS = 14.698   TEMP = 69.60   DENSITY = 0.002317

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-2.2776	-1.6851	-2.3326	-2.1327
0.15	-4.4835	-2.7131	-2.1732	-1.8110
0.25	-4.7947	-2.8064	-2.0942	-1.6705
0.35	-4.3517	-2.3235	-1.7497	-1.4022
0.45	-2.8531	-1.6832	-1.3491	-1.0034
0.55	-1.9663	-1.0669	-0.8945	-0.7371
0.65	-1.6042	-0.6675	-0.5661	-0.4696
0.75	-1.6688	-0.5226	-0.3541	-0.2508
0.85	-1.6480	-0.2932	-0.1865	-0.1311
0.95	-1.1842	-0.0416	0.0061	-0.0039

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-1.9167	-1.6711	-1.5295	-1.4729
0.15	-1.6982	-1.5075	-1.4202	****
0.25	-1.4459	-1.2969	-1.1782	-1.3362
0.35	-1.1718	-1.1142	-1.0469	-1.0393
0.45	-0.8247	-0.8061	-0.8176	-0.7948
0.55	-0.6923	-0.6541	-0.6303	-0.5974
0.65	-0.4629	-0.4780	-0.4637	-0.4178
0.75	-0.2769	-0.3238	-0.3408	-0.3194
0.85	-0.1056	-0.1359	-0.1954	-0.1965
0.95	0.0308	0.0390	0.0406	0.0095

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.3608	0.3894	0.4363	0.4235
0.15	-0.8831	0.1738	0.1716	0.2393
0.30	-0.9756	-0.0806	0.0144	0.0964
0.40	-0.9970	-0.1703	-0.0062	0.0696
0.50	-0.8467	-0.1205	0.0262	0.0840
0.70	-0.6535	0.0350	0.0512	0.0701
0.80	-0.6891	0.0238	0.0347	0.0486
0.90	-0.6577	0.0496	0.0527	0.0424

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.4894	0.3773	0.3697	0.3699
0.15	0.3283	0.2838	0.2886	0.3097
0.30	0.1215	0.1839	0.2173	0.2271
0.40	0.0822	0.1396	0.1628	0.1774
0.50	0.1123	0.1408	0.1530	0.1691
0.70	0.0996	0.0908	0.1018	0.1176
0.80	0.0735	0.0621	0.0910	0.0919
0.90	0.0611	0.0617	0.0846	0.0838

COLL = 18 RPM = 1200 THRUST = 40.64
TORQUE = 11.94 CT/S = 0.1837 CQ/S = 0.0270
PRESS = 14.698 TEMP = 66.03 DENSITY = 0.002334

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-2.2234	-1.7439	-2.5917	-2.3928
0.15	-4.2827	-2.8431	-2.3678	-2.0285
0.25	-5.1471	-2.9108	-2.2262	-1.8349
0.35	-5.0010	-2.3434	-1.8286	-1.5501
0.45	-3.1959	-1.7232	-1.5686	-1.0781
0.55	-2.1572	-1.0379	-0.9021	-0.7646
0.65	-1.8862	-0.6840	-0.5656	-0.4813
0.75	-1.8852	-0.5422	-0.3477	-0.2479
0.85	****	****	****	****
0.95	-1.4854	-0.0873	-0.0009	0.0025

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-2.0625	-1.8279	-1.3765	-1.7173
0.15	-1.8020	-1.6299	-1.1859	-1.4085
0.25	-1.5292	-1.3571	-0.9684	-1.2229
0.35	-1.3113	-1.1626	-0.8166	-1.0666
0.45	-0.8292	-0.8386	-0.5981	-0.8641
0.55	-0.7022	-0.6772	-0.4283	-0.6293
0.65	-0.4768	-0.5019	-0.2733	-0.4473
0.75	-0.2875	-0.3326	-0.1573	-0.3308
0.85	****	****	****	****
0.95	0.0315	0.0376	0.1286	-0.0157

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.4247	0.4515	0.5287	0.5056
0.15	-0.7575	0.2084	0.2609	0.3025
0.30	-1.0507	-0.0718	0.0710	0.1343
0.40	****	-0.1598	0.0339	0.0943
0.50	-0.9425	-0.0871	0.0593	0.1055
0.70	-0.7479	0.0152	0.0769	0.0829
0.80	-0.9407	0.0123	0.0589	0.0580
0.90	-0.8529	0.0573	0.0839	0.0514

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.5477	0.4361	0.4942	0.4370
0.15	0.3752	0.3341	0.4206	0.3619
0.30	0.1494	0.2113	0.3347	0.2555
0.40	0.1084	0.1598	0.2787	0.1980
0.50	0.1218	0.1548	0.2664	0.1673
0.70	0.1058	0.1000	0.2125	0.1099
0.80	0.0740	0.0668	0.1919	0.0797
0.90	0.0611	0.0561	0.1780	0.0626

COLL = 18   RPM = 1800   THRUST = 90.49
TORQUE = 26.52   CT/S = 0.1819   CQ/S = 0.0267
PRESS = 14.698   TEMP = 66.22   DENSITY = 0.002333

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-2.3768	-1.6261	-2.4637	-2.2608
0.15	-4.7266	-2.6896	-2.2460	-1.9148
0.25	-5.2469	-2.7745	-2.1562	-1.7469
0.35	-5.0048	-2.2761	-1.8058	-1.4455
0.45	-3.0766	-1.6676	-1.3885	-1.0235
0.55	-2.2707	-1.1071	-0.9229	-0.7408
0.65	-1.8784	-0.7270	-0.5862	-0.4747
0.75	-2.0029	-0.5722	-0.3576	-0.2482
0.85	****	****	****	****
0.95	-1.7204	-0.0733	-0.007	-0.0131

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-2.0789	-1.7662	-1.6581	-1.6649
0.15	-1.7582	-1.5136	-1.4786	-1.3668
0.25	-1.4947	-1.3138	-1.2169	-1.2011
0.35	-1.1994	-1.0924	-1.0369	-1.0439
0.45	-0.8521	-0.8046	-0.8070	-0.8304
0.55	-0.7060	-0.6442	-0.6063	-0.5971
0.65	-0.4627	-0.4640	-0.4304	-0.4092
0.75	-0.2564	-0.2925	-0.2929	-0.2826
0.85	****	****	****	****
0.95	0.0182	0.0241	-0.0045	-0.0143

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.7098	0.2819	0.4473	0.4576
0.15	-0.8852	0.1269	0.1899	0.2673
0.30	-1.1383	-0.1513	0.0148	0.1133
0.40	****	-0.2669	-0.0014	0.0772
0.50	-0.9816	-0.1456	0.0314	0.0949
0.70	-0.7856	0.0057	0.0413	0.0698
0.80	-0.9964	-0.0070	0.0296	0.0482
0.90	-0.7569	0.0432	0.0583	0.0432

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.5409	0.4283	0.4285	0.4342
0.15	0.3680	0.3277	0.3369	0.3580
0.30	0.1438	0.2097	0.2429	0.2579
0.40	0.1003	0.1604	0.1844	0.2053
0.50	0.1208	0.1560	0.1634	0.1771
0.70	0.1048	0.0998	0.0985	0.1188
0.80	0.0677	0.0655	0.0759	0.0848
0.90	0.0559	0.0554	0.0563	0.0632

COLL = 20   RPM = 400   THRUST = 7.98
TORQUE = 2.17   CT/S = 0.3254   CQ/S = 0.0442
PRESS = 14.698   TEMP = 66.68   DENSITY = 0.002330

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-3.2819	-2.2613	-2.9456
0.15	-5.2095	-3.2837	-2.4497
0.25	-5.6305	-2.8625	-2.1311
0.35	-5.2863	-2.4984	-1.8740
0.45	-3.9100	-2.2153	-1.5760
0.55	-2.6437	-1.1049	-0.8412
0.65	-2.3306	-0.7072	-0.5622
0.75	-1.9905	-0.5057	-0.3494
0.85	-1.9596	-0.3346	-0.2395
0.95	-1.2268	-0.0801	-0.0981

Cpl

r/R x/c	0.125	0.20	0.30
0.10	0.0313	0.6600	0.7195
0.15	-0.0285	0.5049	0.4269
0.30	-0.5234	0.1668	0.1901
0.40	****	****	0.3141
0.50	-0.5691	0.0600	0.0981
0.70	-0.6183	0.1105	0.0864
0.80	-0.7760	0.1057	0.0743
0.90	-0.5754	0.1188	0.0555

COLL = 20
TORQUE = 3.96
PRESS = 14.698

RPM = 600
CT/S = 0.2585
TEMP = 67.45

THRUST = 14.25
CQ/S = 0.0359
DENSITY = 0.002327

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-3.2252	-2.3223	-3.0178
0.15	-5.1825	-3.0449	-2.5849
0.25	-5.2408	-3.0532	-2.1832
0.35	-5.6054	-2.4626	-1.9460
0.45	-4.2232	-2.1750	-1.4602
0.55	-2.4235	-1.1158	-0.8348
0.65	-2.1029	-0.7611	-0.5327
0.75	-2.1264	-0.5236	-0.3530
0.85	-2.0216	-0.3674	-0.2346
0.95	-1.2244	-0.0972	-0.0534

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-0.2235	0.6788	0.7107
0.15	-0.2461	0.4589	0.4689
0.30	-0.7591	0.1417	0.2136
0.40	****	****	0.2335
0.50	-0.7254	0.0423	0.1542
0.70	-0.8284	0.0765	0.0963
0.80	-0.9816	0.1187	0.0844
0.90	-0.7105	0.1145	0.0574

COLL = 20   RPM = 800   THRUST = 22.22
TORQUE = 6.61   CT/S = 0.2266   CQ/S = 0.0337
PRESS = 14.698   TEMP = 66.84   DENSITY = 0.002327

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-3.0752	-2.1058	-2.9867
0.15	-4.8827	-2.7659	-2.5870
0.25	-5.3279	-2.9065	-2.1197
0.35	-5.4354	-2.5008	-1.8331
0.45	-3.7319	-1.7742	-1.5616
0.55	-2.5149	-1.0148	-0.8788
0.65	-2.0684	-0.7310	-0.5315
0.75	-2.2710	-0.5494	-0.3417
0.85	-2.1006	-0.3954	-0.1970
0.95	-1.1953	-0.1196	-0.0092

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-0.0703	0.4952	0.6623
0.15	-0.2497	0.2954	0.4091
0.30	-0.8209	0.0155	0.1663
0.40	****	****	0.1687
0.50	-0.9791	-0.0062	0.1165
0.70	-0.9270	0.0041	0.0902
0.80	-1.0748	0.0140	0.0676
0.90	-0.8538	0.0606	0.0674

COLL = 20   RPM = 1200   THRUST = 45.28
TORQUE = 13.87   CT/S = 0.2053   CQ/S = 0.0315
PRESS = 14.698   TEMP = 67.29   DENSITY = 0.002327

Cpu

r/R \ x/c	0.125	0.20	0.30	0.40
0.06	-2.9816	-1.8904	-2.9723	-2.7079
0.15	-5.0709	-2.9141	-2.5718	-2.1651
0.25	-5.6406	-2.9349	-2.2934	-1.8715
0.35	-5.4818	-2.4635	-1.9017	-1.4872
0.45	-3.3905	-2.0151	-1.4816	-1.0239
0.55	-2.3896	-1.1231	-0.8901	-0.7249
0.65	-2.0124	-0.7688	-0.5642	-0.4386
0.75	-2.0617	-0.5857	-0.3454	-0.2400
0.85	-2.0259	-0.4118	-0.1949	-0.1520
0.95	-1.3246	-0.1333	-0.0156	-0.0216

r/R \ x/c	0.50	0.60	0.70	0.75
0.06	-2.4664	-2.2417	-1.9513	-1.8776
0.15	-1.9802	-1.7736	-1.6621	-1.4169
0.25	-1.6783	-1.3776	-1.3055	-1.2571
0.35	-1.1968	-1.2394	-1.0782	-1.0567
0.45	-0.8437	-0.8503	-0.8032	-0.7826
0.55	-0.6729	-0.6119	-0.5668	-0.5497
0.65	-0.4233	-0.4259	-0.3745	-0.3664
0.75	-0.2338	-0.3099	-0.2564	-0.2825
0.85	-0.1259	-0.2622	-0.2214	-0.2433
0.95	-0.0016	-0.1139	-0.0991	-0.0923

Cpl

r/R \ x/c	0.125	0.20	0.30	0.40
0.10	-0.2797	0.4365	0.6229	0.6187
0.15	-0.5150	0.2287	0.3765	0.4245
0.30	-0.9332	-0.0956	0.1564	0.2149
0.40	****	-0.1411	0.1305	0.1655
0.50	-0.8449	-0.1628	0.0952	0.1528
0.70	-0.7863	-0.0546	0.0793	0.0950
0.80	-0.9602	-0.0576	0.0612	0.0567
0.90	-0.7558	-0.0049	0.0616	0.0332

r/R \ x/c	0.50	0.60	0.70	0.75
0.10	0.6614	0.5950	0.5722	0.5735
0.15	0.4933	0.4651	0.4745	0.4798
0.30	0.2398	0.2946	0.3188	0.3304
0.40	0.1802	0.2319	0.2406	0.2589
0.50	0.1698	0.2004	0.1994	0.2088
0.70	0.1200	0.1035	0.1016	0.1165
0.80	0.0780	0.0518	0.0620	0.0705
0.90	0.0441	0.0018	0.0135	0.0269

COLL = 20   RPM = 1800   THRUST = 97.97
TORQUE = 30.84   CT/S = 0.1973   CQ/S = 0.0311
PRESS = 14.698   TEMP = 67.19   DENSITY = 0.002328

Cpu

r/R x/c	0.125	0.20	0.30	0.40
0.06	-2.9209	-2.0870	-2.7986	-2.5445
0.15	-5.5029	-3.0113	-2.4374	-2.0293
0.25	-5.7464	-3.0585	-2.2562	-1.7796
0.35	-5.4184	-2.4993	-1.8818	-1.4094
0.45	-3.3753	-1.7058	-1.3530	-1.0068
0.55	-2.3998	-1.1408	-0.9060	-0.7074
0.65	-1.9427	-0.7478	-0.5787	-0.4310
0.75	-1.9612	-0.5874	-0.3749	-0.2424
0.85	-1.9609	-0.3749	-0.2098	-0.1603
0.95	-1.3248	-0.088	-0.0055	-0.033

r/R x/c	0.50	0.60	0.70	0.75
0.06	-2.4647	-1.9817	-1.9037	-1.9311
0.15	-1.9248	-1.4718	-1.6283	-1.3818
0.25	-1.5629	-1.1676	-1.2636	-1.3630
0.35	-1.1931	-1.1348	-1.0526	-1.0093
0.45	-0.8396	-0.7386	-0.7780	-0.7250
0.55	-0.6625	-0.5640	-0.5483	-0.5109
0.65	-0.4077	-0.4131	-0.3568	-0.3460
0.75	-0.2318	-0.3262	-0.2408	-0.2673
0.85	-0.1409	-0.2255	-0.2072	-0.2118
0.95	-0.0190	-0.0664	-0.0826	-0.0759

Cpl

r/R x/c	0.125	0.20	0.30	0.40
0.10	-0.3708	0.4493	0.5519	0.5839
0.15	-0.6873	0.2621	0.3275	0.3991
0.30	-1.0408	-0.0513	0.1215	0.2020
0.40	****	-0.1508	0.0972	0.1506
0.50	-0.9282	-0.1156	0.0827	0.1464
0.70	-0.9191	-0.0138	0.0746	0.0939
0.80	-1.0680	-0.0157	0.0601	0.0546
0.90	-0.8730	0.0330	0.0629	0.0273

r/R x/c	0.50	0.60	0.70	0.75
0.10	0.6392	0.5806	0.5667	0.5747
0.15	0.4760	0.4545	0.4704	0.4828
0.30	0.2298	0.2893	0.3200	0.3348
0.40	0.1722	0.2262	0.2418	0.2632
0.50	0.1666	0.1979	0.2032	0.2176
0.70	0.1184	0.1063	0.1063	0.1288
0.80	0.0741	0.0551	0.0715	0.0812
0.90	0.0387	0.0106	0.0261	0.0356

COLL = 22   RPM = 1200   THRUST = 43.85
TORQUE = 14.20   CT/S = 0.2000   CQ/S = 0.0324
PRESS = 14.698   TEMP = 70.26   DENSITY = 0.002313

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-3.0537	-2.0993	-2.8021	-2.8714
0.15	-5.1179	-2.8878	-2.4114	-2.2721
0.25	-5.7857	-2.8875	-2.1797	-1.9428
0.35	-5.1226	-2.3504	-1.8294	-1.5252
0.45	-2.1798	****	-1.6483	-0.9436
0.55	-2.2179	-1.1226	-0.8865	-0.7402
0.65	-1.9222	-0.7528	-0.5817	-0.4486
0.75	-1.9219	-0.6098	-0.3731	-0.2656
0.85	****	****	****	****
0.95	****	****	-0.2711	-0.1493

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-2.6362	-2.2283	-2.0094	-2.0362
0.15	-2.0934	-1.8442	-1.7134	-1.6167
0.25	-1.6867	-1.4633	-1.3200	-1.3126
0.35	-1.2198	-1.1700	-1.0617	-1.0587
0.45	-0.8642	-0.8328	-0.7727	-0.7821
0.55	-0.6787	-0.6040	-0.5351	-0.5200
0.65	-0.4201	-0.3842	-0.3623	-0.3561
0.75	-0.2426	-0.2755	-0.2754	-0.2871
0.85	****	****	****	****
0.95	-0.0650	-0.1450	-0.1269	-0.1675

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	0.4004	-0.2239	0.5645	0.7140
0.15	-0.3984	-0.4920	0.4107	0.4677
0.30	-0.9726	-0.0408	0.1428	0.2286
0.40	-1.0791	-0.1491	0.0560	0.1371
0.50	-0.8698	-0.0958	0.0746	0.1473
0.70	-0.7762	-0.0070	0.0622	0.0850
0.80	-0.9189	-0.0324	0.0339	0.0424
0.90	-0.8471	-0.0113	0.0509	0.0144

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.8915	0.6426	0.6068	0.6230
0.15	0.5396	0.5088	0.5033	0.5205
0.30	0.2605	0.3197	0.3380	0.3553
0.40	0.2020	0.2365	0.2465	0.2754
0.50	0.1759	0.2070	0.2045	0.2147
0.70	0.1170	0.1010	0.0977	0.1135
0.80	0.0683	0.0368	0.0508	0.0595
0.90	0.0289	-0.0197	-0.0034	0.0062

COLL = 22　　　　　RPM = 1800　　　　　THRUST = 97.86
TORQUE = 31.82　　　CT/S = 0.1988　　　CQ/S = 0.0323
PRESS = 14.698　　　TEMP = 71.46　　　DENSITY = 0.002308

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-3.2507	-2.2141	-2.9860	-2.7726
0.15	-5.6306	-3.1207	-2.5783	-2.2000
0.25	-6.0620	-3.1707	-2.3510	-1.8609
0.35	-4.9707	-2.5138	-1.9396	-1.4561
0.45	-4.2295	****	-1.7406	-1.0114
0.55	-2.2737	-1.1318	-0.9118	-0.7194
0.65	-1.9822	-0.7095	-0.5788	-0.4355
0.75	-1.9312	-0.5789	-0.3840	-0.2589
0.85	****	****	****	****
0.95	****	****	-0.5304	-0.1902

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-2.6203	-2.1410	-1.9929	-2.0747
0.15	-2.0061	-1.7698	-1.6713	-1.5594
0.25	-1.5946	-1.4144	-1.2788	-1.2661
0.35	-1.2169	-1.1284	-1.0278	-1.0180
0.45	-0.8528	-0.8014	-0.7447	-0.7385
0.55	-0.6603	-0.5794	-0.5088	-0.4889
0.65	-0.4085	-0.3630	-0.3400	-0.3405
0.75	-0.2461	-0.2749	-0.2593	-0.2879
0.85	****	****	****	****
0.95	-0.0756	-0.1473	-0.1098	-0.1599

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-1.0936	-0.6218	0.3280	0.6475
0.15	-1.4008	-0.7345	0.1536	0.4554
0.30	-0.9225	-0.0180	0.1478	0.2252
0.40	-0.9969	-0.1142	0.1033	0.1521
0.50	-0.9276	-0.0855	0.0946	0.1488
0.70	-0.6996	0.0293	0.0824	0.0862
0.80	-0.9388	0.0175	0.0678	0.0383
0.90	-0.9116	-0.0110	0.0560	0.0098

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.7804	0.6154	0.6044	0.6123
0.15	0.6052	0.4862	0.5014	0.5111
0.30	0.2541	0.3118	0.3404	0.3563
0.40	0.1900	0.2360	0.2569	0.2802
0.50	0.1763	0.2069	0.2142	0.2256
0.70	0.1174	0.1055	0.1089	0.1287
0.80	0.0688	0.0413	0.0679	0.0703
0.90	0.0302	-0.0093	0.0170	0.0220

COLL = 25   RPM = 400   THRUST = 7.86
TORQUE = 2.63   CT/S = 0.3207   CQ/S = 0.0535
PRESS = 14.698   TEMP = 67.43   DENSITY = 0.002328

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-3.7423	-3.0461	-3.5945
0.15	-6.7692	-3.6783	-2.9435
0.25	-6.7033	-3.4583	-2.2796
0.35	-5.7704	-2.8452	-2.2156
0.45	-4.9760	-2.4168	-1.4490
0.55	-2.4503	-1.3635	-0.9706
0.65	-2.1170	-0.9448	-0.7307
0.75	-1.9477	-0.8055	-0.6148
0.85	****	-0.6151	-0.4773
0.95	-1.5626	-0.24	-0.2713

Cpl

r/R x/c	0.125	0.20	0.30
0.10	0.0845	0.7606	0.8922
0.15	-0.0161	0.4794	0.5987
0.30	-0.8004	0.0584	0.2537
0.40	****	-0.2604	0.1156
0.50	-0.9753	-0.1313	0.0929
0.70	-0.8950	0.0043	0.0647
0.80	-0.9202	-0.0890	-0.0158
0.90	-0.8866	-0.0277	-0.0591

COLL = 25   RPM = 600   THRUST = 14.16
TORQUE = 5.47   CT/S = 0.2569   CQ/S = 0.0496
PRESS = 14.698   TEMP = 67.23   DENSITY = 0.002327

Cpu

x/c \ r/R	0.125	0.20	0.30
0.06	-3.8633	-2.7692	-3.4364
0.15	-6.5687	-3.7596	-2.8380
0.25	-6.6874	-3.3560	-2.2841
0.35	-5.9763	-2.9094	-2.1779
0.45	-4.3471	-2.1245	-1.5005
0.55	-2.4450	-1.2241	-0.8977
0.65	-2.0250	-0.9158	-0.6033
0.75	-2.1215	-0.7828	-0.4666
0.85	-2.1372	-0.5591	-0.3038
0.95	-1.6892	-0.2643	-0.1058

Cpl

x/c \ r/R	0.125	0.20	0.30
0.10	0.1630	0.5718	0.7223
0.15	-0.2001	0.4139	0.5067
0.30	-0.8561	0.0138	0.2185
0.40	****	-0.3096	0.0819
0.50	-0.9575	-0.1329	0.0965
0.70	-0.8903	-0.0417	0.0524
0.80	-1.0800	-0.0527	0.0104
0.90	-1.0987	-0.0377	-0.0063

```
COLL = 25              RPM = 800            THRUST = 23.69
TORQUE = 9.01          CT/S = 0.2417        CQ/S = 0.0460
PRESS = 14.698         TEMP = 67.83         DENSITY = 0.002326
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Cpu

r/R x/c	0.125	0.20	0.30
0.06	-3.2875	-2.9454	-3.5641
0.15	-6.4025	-3.7855	-2.9780
0.25	-7.3313	-3.3927	-2.4447
0.35	-5.5067	-2.9208	-2.2677
0.45	-4.2280	-1.9969	-1.4597
0.55	-2.5318	-1.2271	-0.9218
0.65	-2.1186	-0.8642	-0.6194
0.75	-2.1719	-0.7277	-0.4290
0.85	-2.1692	-0.5243	-0.2873
0.95	-1.7515	-0.2261	-0.1148

Cpl

r/R x/c	0.125	0.20	0.30
0.10	0.3076	0.6739	0.7900
0.15	-0.2885	0.4906	0.5562
0.30	-0.8867	0.0248	0.2212
0.40	****	-0.2132	0.1130
0.50	-0.9698	-0.1420	0.1062
0.70	-1.0108	-0.0295	0.0714
0.80	-1.0861	-0.0432	0.0195
0.90	-1.0584	-0.0324	0.0138

COLL = 25   RPM = 1200   THRUST = 48.21
TORQUE = 20.04   CT/S = 0.2184   CQ/S = 0.0454
PRESS = 14.698   TEMP = 67.04   DENSITY = 0.002329

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-3.6218	-2.7227	-3.4004	-3.1723
0.15	-6.3517	-3.7152	-2.8559	-2.4344
0.25	-6.7953	-3.6208	-2.4304	-1.9039
0.35	-6.0069	-2.8591	-2.0949	-1.5016
0.45	-3.9173	-1.9078	-1.4852	-1.0988
0.55	-2.6600	-1.2299	-0.9811	-0.7414
0.65	-2.2551	-0.8500	-0.6328	-0.4623
0.75	-2.2393	-0.7296	-0.4394	-0.3264
0.85	-2.2300	-0.5086	-0.2806	-0.2541
0.95	-1.9549	-0.2773	-0.0955	-0.1067

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-3.1570	-2.4556	-2.4197	-2.4564
0.15	-2.1953	-1.9339	-1.8774	-1.7277
0.25	-1.6425	-1.3234	-1.2873	-1.2440
0.35	-1.3105	-0.9339	-1.0569	-0.9869
0.45	-0.9197	-0.7500	-0.7517	-0.8124
0.55	-0.6888	-0.6594	-0.5565	-0.6696
0.65	-0.4753	-0.5144	-0.4642	-0.6149
0.75	-0.3579	-0.3957	-0.4429	-0.5568
0.85	-0.2831	-0.4014	-0.4152	-0.5018
0.95	-0.0718	-0.2039	-0.2121	-0.3117

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.3636	0.5103	0.7085	0.7140
0.15	-0.9484	0.2985	0.4609	0.5354
0.30	-1.4608	-0.1055	0.1850	0.2812
0.40	****	-0.2911	0.0889	0.1964
0.50	-1.4802	-0.2026	0.0825	0.1690
0.70	-1.2610	-0.1253	0.0436	0.0802
0.80	-1.3470	-0.1376	0.0146	0.0287
0.90	-1.3110	-0.1019	0.0066	-0.0199

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.7901	0.7301	0.7156	0.7125
0.15	0.6265	0.5929	0.6053	0.6021
0.30	0.3231	0.3656	0.3878	0.3964
0.40	0.2411	0.2826	0.2922	0.2926
0.50	0.2014	0.2224	0.2186	0.2269
0.70	0.1133	0.0826	0.0716	0.0962
0.80	0.0519	0.0104	0.0119	0.0268
0.90	-0.0053	-0.0751	-0.0726	-0.0531

COLL = 25   RPM = 1800   THRUST = 104.14
TORQUE = 45.06   CT/S = 0.2096   CQ/S = 0.0453
PRESS = 14.698   TEMP = 66.89   DENSITY = 0.002330

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-3.8106	-2.5734	-3.2559	-3.1775
0.15	-6.8158	-3.4790	-2.7491	-2.4242
0.25	-7.1763	-3.5677	-2.4347	-1.9531
0.35	-6.1655	-2.9317	-2.0019	-1.5578
0.45	-3.7106	-1.9379	-1.4490	-1.0961
0.55	-2.6644	-1.3450	-0.9895	-0.7352
0.65	-2.2339	-0.9116	-0.6620	-0.4632
0.75	-2.2449	-0.7242	-0.4680	-0.3307
0.85	-2.2172	-0.5008	-0.2887	-0.2695
0.95	-1.9652	-0.2563	-0.078	-0.1232

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-2.9944	-2.5032	-2.3918	-2.4488
0.15	-2.1235	-1.9363	-1.8395	-1.6795
0.25	-1.6166	-1.4007	-1.2992	-1.2215
0.35	-1.2692	-1.0402	-1.0378	-0.9766
0.45	-0.8925	-0.8384	-0.7259	-0.7469
0.55	-0.6659	-0.6065	-0.5379	-0.6106
0.65	-0.4572	-0.4015	-0.4560	-0.5855
0.75	-0.3502	-0.3073	-0.4137	-0.5197
0.85	-0.2831	-0.3221	-0.3955	-0.4782
0.95	-0.0894	-0.1626	-0.1912	-0.2777

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.0915	0.5687	0.6252	0.6960
0.15	-0.7755	0.3012	0.3941	0.5125
0.30	-1.2677	-0.1230	0.1361	0.2645
0.40	****	-0.2816	0.0660	0.1872
0.50	-1.3400	-0.2439	0.0544	0.1566
0.70	-1.0674	-0.1304	0.0300	0.0740
0.80	-1.2845	-0.1576	0.0104	0.0212
0.90	-1.2747	-0.1080	0.0080	-0.0263

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.7536	0.7237	0.6951	0.6865
0.15	0.5964	0.5836	0.5857	0.5845
0.30	0.3060	0.3649	0.3808	0.3909
0.40	0.2212	0.2851	0.2821	0.3014
0.50	0.1896	0.2301	0.2181	0.2393
0.70	0.1107	0.0943	0.0817	0.1095
0.80	0.0498	0.0208	0.0284	0.0558
0.90	-0.0087	-0.0568	-0.0459	-0.0334

COLL = 26
TORQUE = 2.82
PRESS = 14.698

RPM = 400
CT/S = 0.2343
TEMP = 67.37

THRUST = 5.74
CQ/S = 0.0575
DENSITY = 0.002325

Cpu

x/c \ r/R	0.20	0.30	0.40	0.50
0.06	-3.0943	-3.6899	-3.3215	-3.1640
0.15	-3.8608	-2.9577	-2.6544	-2.3633
0.25	-3.6609	-2.3499	-2.2746	-1.7601
0.35	-2.8410	-2.2030	-1.5816	-1.3027
0.45	-2.5588	-1.5305	-1.0386	-0.9421
0.55	-1.4647	-1.0290	-0.7395	-0.7234
0.65	-1.0498	-0.7192	-0.4873	-0.5206
0.75	-0.8109	-0.6043	-0.3210	-0.3634
0.85	••••	••••	••••	••••
0.95	••••	0.0367	-0.3229	-0.0511

Cpl

x/c \ r/R	0.20	0.30	0.40	0.50
0.10	••••	1.2046	0.6426	0.8489
0.15	0.4621	0.6139	0.6115	0.6490
0.30	0.0369	0.2398	0.3151	0.3350
0.40	••••	0.2793	0.4161	0.2903
0.50	-0.2302	0.0983	0.1543	0.1962
0.70	-0.1658	0.0067	0.0451	0.0948
0.80	-0.0754	-0.0274	-0.0098	0.0294
0.90	-0.0108	-0.0838	-0.0852	-0.0368

COLL = 26   RPM = 600   THRUST = 12.30
TORQUE = 5.75   CT/S = 0.2234   CQ/S = 0.0522
PRESS = 14.698   TEMP = 67.53   DENSITY = 0.002324

Cpu

r/R x/c	0.20	0.30	0.40	0.50
0.06	-2.8081	-3.6396	-3.3377	-3.3529
0.15	-3.7938	-3.0097	-2.5154	-2.3633
0.25	-3.5018	-2.5320	-2.1716	-1.7307
0.35	-3.0587	-2.2576	-1.5171	-1.3547
0.45	-2.2130	-1.5277	-1.0999	-0.9460
0.55	-1.3231	-0.9258	-0.7189	-0.7174
0.65	-1.0098	-0.6319	-0.4782	-0.5259
0.75	-0.7928	-0.4789	-0.3269	-0.3860
0.85	****	****	****	****
0.95	****	0.1473	-0.1235	-0.0502

Cpl

r/R x/c	0.20	0.30	0.40	0.50
0.10	****	1.1495	0.7909	0.9276
0.15	0.3820	0.5342	0.5832	0.6041
0.30	-0.0359	0.2277	0.3041	0.3333
0.40	****	0.2305	0.2966	0.2603
0.50	-0.2003	0.0806	0.1761	0.1966
0.70	-0.1297	0.0230	0.0701	0.1134
0.80	-0.1304	-0.0019	0.0184	0.0346
0.90	-0.0756	-0.0382	-0.0332	-0.0155

COLL = 26　　　　　RPM = 800　　　　　THRUST = 20.66
TORQUE = 9.68　　　CT/S = 0.2110　　　CQ/S = 0.0495
PRESS = 14.698　　　TEMP = 67.49　　　DENSITY = 0.002324

Cpu

x/c \ r/R	0.20	0.30	0.40	0.50
0.06	-2.5011	-3.6521	-3.2844	-3.1969
0.15	-3.6676	-3.0699	-2.5831	-2.2447
0.25	-3.5393	-2.5954	-2.0753	-1.7534
0.35	-3.0142	-2.3264	-1.5538	-1.3500
0.45	-2.1204	-1.5212	-1.1089	-0.9334
0.55	-1.3417	-0.9829	-0.7507	-0.7250
0.65	-0.9897	-0.6597	-0.4843	-0.5298
0.75	-0.8310	-0.4446	-0.3285	-0.3885
0.85	****	****	****	****
0.95	****	0.1131	-0.1455	-0.1210

Cpl

x/c \ r/R	0.20	0.30	0.40	0.50
0.10	****	1.1190	0.7866	0.8402
0.15	0.2622	0.5242	0.5340	0.6155
0.30	-0.1664	0.2065	0.2871	0.3310
0.40	-0.1646	0.1893	0.2535	0.2488
0.50	-0.3308	0.0806	0.1599	0.1956
0.70	-0.2007	0.0236	0.0766	0.1006
0.80	-0.2122	-0.0008	0.0164	0.0384
0.90	-0.1393	-0.0126	-0.0366	-0.0193

COLL = 26　　　　RPM = 1200　　　　THRUST = 45.03
TORQUE = 21.25　　CT/S = 0.2047　　CQ/S = 0.0483
PRESS = 14.698　　TEMP = 68.21　　DENSITY = 0.002321

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-3.8078	-2.7004	-3.5713	-3.2336
0.15	-6.4366	-3.6589	-2.9509	-2.4596
0.25	-7.0170	-3.4840	-2.5798	-2.0295
0.35	-6.5083	-2.9672	-2.2132	-1.5578
0.45	-4.0814	-2.1024	-1.5349	-1.1200
0.55	-2.9072	-1.3968	-1.0136	-0.7610
0.65	-2.3995	-0.9681	-0.6757	-0.4915
0.75	-2.4530	-0.8108	-0.4753	-0.3447
0.85	****	****	****	****
0.95	****	****	-0.025	-0.2067

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-3.2841	-2.4166	-2.4528	-2.6348
0.15	-2.2445	-1.9929	-1.8948	-1.7828
0.25	-1.7471	-1.4119	-1.3774	-1.3125
0.35	-1.3221	-1.0330	-1.0457	-0.9825
0.45	-0.9248	-0.7602	-0.7572	-0.7782
0.55	-0.6981	-0.6258	-0.6302	-0.6624
0.65	-0.4952	-0.4905	-0.5512	-0.5792
0.75	-0.3838	-0.4361	-0.5060	-0.5484
0.85	****	****	****	****
0.95	-0.2127	-0.3344	-0.3932	-0.3783

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	****	****	0.9060	0.7183
0.15	-0.8975	0.2880	0.4167	0.5230
0.30	-1.5180	-0.1651	0.1474	0.2720
0.40	-1.7516	-0.2555	0.0875	0.2118
0.50	-1.6168	-0.3074	0.0456	0.1544
0.70	-1.4350	-0.2260	0.0145	0.0611
0.80	-1.5475	-0.2255	-0.0138	0.0079
0.90	-1.4720	-0.1569	-0.0159	-0.0337

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.7644	0.7521	0.7251	0.7401
0.15	0.6166	0.5954	0.6121	0.6020
0.30	0.3234	0.3712	0.3940	0.3972
0.40	0.2387	0.2751	0.2825	0.2913
0.50	0.1967	0.2195	0.2152	0.2206
0.70	0.1053	0.0771	0.0692	0.0856
0.80	0.0382	-0.0078	-0.0023	0.0128
0.90	-0.0190	-0.0882	-0.0892	-0.0696

COLL = 26   RPM = 1800   THRUST = 101.41
TORQUE = 47.51 CT/S = 0.2049   CQ/S = 0.0480
PRESS = 14.698   TEMP = 68.34   DENSITY = 0.002320

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-3.8059	-2.5321	-3.4569	-3.1115
0.15	-6.9014	-3.4884	-2.9466	-2.3880
0.25	-7.2776	-3.5974	-2.5304	-1.9517
0.35	-6.4596	-3.0106	-2.1389	-1.5268
0.45	-4.1945	-2.1038	-1.5484	-1.0876
0.55	-3.1481	-1.4816	-1.0504	-0.7526
0.65	-2.5446	-1.0395	-0.7123	-0.4890
0.75	-2.5280	-0.8317	-0.5087	-0.3507
0.85	****	****	****	****
0.95	****	****	-0.041	-0.1787

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-3.0501	-2.4582	-2.4266	-2.5352
0.15	-2.2087	-2.3484	-1.8697	-1.6992
0.25	-1.7224	-1.3800	-1.3541	-1.2890
0.35	-1.2940	-1.0081	-1.0179	-0.9787
0.45	-0.8968	-0.7188	-0.7226	-0.7905
0.55	-0.6825	-0.6066	-0.5720	-0.6519
0.65	-0.4853	-0.4623	-0.4925	-0.6050
0.75	-0.3737	-0.3866	-0.4633	-0.5540
0.85	****	****	****	****
0.95	-0.1972	-0.2930	-0.3625	-0.3737

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	****	****	0.8231	0.7212
0.15	-1.2828	0.1586	0.4134	0.4970
0.30	-1.9074	-0.2846	0.1254	0.2502
0.40	-2.0769	-0.4092	0.0739	0.1873
0.50	-1.8376	-0.4311	0.0330	0.1523
0.70	-1.5756	-0.3001	-0.0051	0.0614
0.80	-1.6725	-0.2938	-0.0228	0.0078
0.90	-1.5581	-0.2211	-0.0151	-0.0405

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.7618	0.7247	0.7032	0.7086
0.15	0.5995	0.5885	0.6061	0.6008
0.30	0.3123	0.3682	0.3923	0.3994
0.40	0.2256	0.2742	0.2836	0.2988
0.50	0.1964	0.2235	0.2237	0.2333
0.70	0.1053	0.0894	0.0801	0.1041
0.80	0.0373	0.0090	0.0184	0.0465
0.90	-0.0179	-0.0648	-0.0599	-0.0476

COLL = 27   RPM = 400   THRUST = 6.56
TORQUE = 2.80   CT/S = 0.2693   CQ/S = 0.0575
PRESS = 14.698   TEMP = 71.04   DENSITY = 0.002312

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-4.3753	-2.4589	-3.7171
0.15	-6.4027	-3.2408	-3.1185
0.25	-7.6102	-3.2221	-2.4255
0.35	-6.3795	-2.9501	-2.4222
0.45	-6.2329	-2.5509	-1.5472
0.55	-3.3161	-1.4834	-1.0674
0.65	-2.7622	-1.0545	-0.7552
0.75	-2.6516	-0.8715	-0.6453
0.85	****	****	****
0.95	****	****	****

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-0.4413	0.3833	0.8224
0.15	-0.7734	0.1791	0.5396
0.30	-1.7871	-0.2339	0.1697
0.40	****	****	****
0.50	-1.7608	-0.3185	0.0500
0.70	-1.4387	-0.2355	-0.0232
0.80	-1.6916	-0.2907	-0.0982
0.90	-1.6323	-0.1984	-0.1094

COLL = 27   RPM = 600   THRUST = 13.22
TORQUE = 5.82   CT/S = 0.2413   CQ/S = 0.0532
PRESS = 14.698   TEMP = 71.03   DENSITY = 0.002312

Cpu

x/c \ r/R	0.125	0.20	0.30
0.06	-4.0721	-3.1063	-3.9956
0.15	-6.5988	-3.7588	-3.2767
0.25	-6.9617	-3.5904	-2.5947
0.35	-6.5102	-3.0855	-2.5324
0.45	-4.9799	-2.0704	-1.6086
0.55	-2.8388	-1.3216	-1.0109
0.65	-2.4685	-1.0739	-0.7057
0.75	-2.4361	-0.8513	-0.5273
0.85	****	****	****
0.95	****	****	****

Cpl

x/c \ r/R	0.125	0.20	0.30
0.10	-0.3108	0.5681	0.8004
0.15	-0.8463	0.3017	0.5802
0.30	-1.4170	-0.1475	0.2299
0.40	****	****	****
0.50	-1.5921	-0.2721	0.0580
0.70	-1.4572	-0.2087	0.0079
0.80	-1.5849	-0.2020	-0.0542
0.90	-1.5458	-0.1249	-0.0479

COLL = 27
TORQUE =10.72
PRESS = 14.698

RPM = 800
CT/S = 0.2291
TEMP = 71.04

THRUST = 22.31
CQ/S = 0.0550
DENSITY = 0.002312

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-4.1271	-3.2042	-4.0380
0.15	-7.0080	-4.0351	-3.3070
0.25	-7.2409	-3.5836	-2.7055
0.35	-6.5491	-3.3593	-2.5369
0.45	-4.3346	-2.1437	-1.5822
0.55	-2.8546	-1.3423	-1.0473
0.65	-2.3663	-0.9764	-0.6867
0.75	-2.3476	-0.8114	-0.4794
0.85	-2.6704	****	****
0.95	****	****	****

Cpl

r/R x/c	0.125	0.20	0.30
0.10	0.2914	0.6372	0.8559
0.15	-0.6540	0.4170	0.5681
0.30	-1.2531	-0.0852	0.2092
0.40	****	-0.4536	-0.0795
0.50	-1.2671	-0.2808	0.0643
0.70	-1.2547	-0.1300	0.0090
0.80	-1.3967	-0.1475	-0.0510
0.90	-1.3060	-0.1235	-0.0274

COLL = 27   RPM = 1200   THRUST = 47.36
TORQUE = 23.40   CT/S = 0.2158   CQ/S = 0.0533
PRESS = 14.698   TEMP = 70.11   DENSITY = 0.002316

Cpu

x/c \ r/R	0.125	0.20	0.30	0.50
0.06	-4.4621	-3.1712	-3.9988	-3.2876
0.15	-7.0953	-4.0705	-3.2958	-2.2744
0.25	-7.6170	-3.9610	-2.7995	-1.7771
0.35	-6.6570	-3.4306	-2.3482	-1.3583
0.45	-4.0772	-2.0656	-1.5937	-0.9509
0.55	-2.8671	-1.3848	-1.0566	-0.7295
0.65	-2.4155	-0.9868	-0.7066	-0.5231
0.75	-2.4901	-0.8071	-0.5094	-0.4117
0.85	****	****	****	****
0.95	****	****	****	0.018

x/c \ r/R	0.60	0.70	0.75
0.06	-2.6649	-2.5212	-2.7179
0.15	-2.0877	-1.8754	-1.8516
0.25	-1.5311	-1.3341	-1.3187
0.35	-1.1054	-1.0103	-1.0404
0.45	-0.7973	-0.7961	-0.8259
0.55	-0.6596	-0.6855	-0.7072
0.65	-0.5718	-0.5991	-0.6453
0.75	-0.5310	-0.5506	-0.5809
0.85	****	****	****
0.95	-0.3978	-0.3246	-0.4013

Cpl

x/c \ r/R	0.125	0.20	0.30	0.50
0.10	0.0333	0.6021	0.8095	0.7829
0.15	-0.4214	0.3642	0.5619	0.6207
0.30	-1.1710	-0.1217	0.2262	0.3232
0.40	-1.5414	-0.4198	0.0137	0.2079
0.50	-1.2289	-0.2939	0.0785	0.1859
0.70	-1.1146	-0.1799	0.0380	0.0913
0.80	-1.3986	-0.1937	-0.0183	0.0279
0.90	-1.2650	-0.1285	-0.0124	-0.0297

x/c \ r/R	0.60	0.70	0.75
0.10	0.7591	0.7266	0.7133
0.15	0.6172	0.6188	0.5917
0.30	0.3802	0.3938	****
0.40	0.2844	0.2843	0.2965
0.50	0.2221	0.2066	0.2197
0.70	0.0693	0.0585	0.0808
0.80	-0.0134	-0.0067	0.0076
0.90	-0.1110	-0.0997	-0.0872

COLL = 27   RPM = 1800   THRUST = 103.96
TORQUE = 52.97   CT/S = 0.2108   CQ/S = 0.0537
PRESS = 14.698   TEMP = 70.68   DENSITY = 0.002313

Cpu

r/R x/c	0.125	0.20	0.30	0.50
0.06	-4.0025	-2.6362	-3.5917	-3.0335
0.15	-6.8966	-3.6566	-3.0232	-2.2884
0.25	-7.4488	-3.6273	-2.6528	-1.7781
0.35	-6.7425	-3.0988	-2.1771	-1.3282
0.45	-3.9828	-2.0961	-1.5649	-0.9210
0.55	-2.8928	-1.4855	-1.0745	-0.7047
0.65	-2.4521	-1.0370	-0.7276	-0.5099
0.75	-2.4785	-0.8482	-0.5251	-0.4124
0.85	****	****	****	****
0.95	****	-0.2843	-0.0725	-0.1191

r/R x/c	0.60	0.70	0.75
0.06	-2.6369	-2.4755	-2.5989
0.15	-2.1001	-1.8481	-1.7042
0.25	-1.4852	-1.3233	-1.2304
0.35	-1.0465	-0.9938	-0.9280
0.45	-0.7573	-0.7594	-0.8069
0.55	-0.6262	-0.6575	-0.7036
0.65	-0.4768	-0.5644	-0.6537
0.75	-0.4330	-0.5188	-0.5807
0.85	****	****	****
0.95	-0.3208	-0.3080	-0.4004

Cpl

r/R x/c	0.125	0.20	0.30	0.50
0.10	-0.3184	0.4434	0.6887	0.7932
0.15	-0.8598	0.1542	0.4274	0.6182
0.30	-1.5288	-0.2659	0.1320	0.3217
0.40	-1.6992	-0.4595	0.0072	0.2183
0.50	-1.5473	-0.3873	0.0177	0.1876
0.70	-1.3778	-0.2653	-0.0054	0.0938
0.80	-1.5105	-0.2683	-0.0369	0.0291
0.90	-1.4860	-0.1994	-0.0249	-0.0358

r/R x/c	0.60	0.70	0.75
0.10	0.7438	0.7135	0.6680
0.15	0.6031	0.6036	0.5788
0.30	0.3740	0.3861	****
0.40	0.2831	0.2882	0.3004
0.50	0.2256	0.2168	0.2353
0.70	0.0747	0.0679	0.0948
0.80	-0.0019	0.0089	0.0378
0.90	-0.0788	-0.0743	-0.0640

COLL = 28   RPM = 400   THRUST = 7.94
TORQUE = 3.37   CT/S = 0.3250   CQ/S = 0.0689
PRESS = 14.698   TEMP = 69.01   DENSITY = 0.002320

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-4.7902	-3.1285	-3.5914
0.15	-6.5254	-4.0122	-3.0685
0.25	-7.5627	-3.4946	-2.4282
0.35	-6.5493	-3.1331	-2.3158
0.45	-5.9576	-2.6895	-1.5178
0.55	-2.8576	-1.5035	-0.9924
0.65	-2.3172	-1.1930	-0.8149
0.75	-2.2725	-1.0936	-0.6164
0.85	-2.5242	****	****
0.95	-1.905	-0.3344	-0.3135

Cpl

r/R x/c	0.125	0.20	0.30
0.10	0.3874	0.6145	0.7828
0.15	-0.4037	0.4040	0.5240
0.30	-1.0730	-0.0785	0.1958
0.40	****	****	-0.0121
0.50	-1.0790	-0.2168	0.0208
0.70	-1.1659	-0.1260	-0.0314
0.80	-1.4153	-0.1972	-0.0836
0.90	-1.5109	-0.1138	-0.1059

COLL = 28 RPM = 600 THRUST = 14.38
TORQUE = 6.93 CT/S = 0.2617 CQ/S = 0.0630
PRESS = 14.698 TEMP = 69.27 DENSITY = 0.002319

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-4.3217	-3.3223	-3.9728
0.15	-6.5552	-4.2478	-3.1644
0.25	-7.3295	-3.6160	-2.6535
0.35	-6.8218	-3.3611	-2.4736
0.45	-5.4290	-2.1865	-1.5494
0.55	-3.0797	-1.3898	-0.9908
0.65	-2.5526	-1.0472	-0.6788
0.75	-2.4833	-0.9786	-0.5288
0.85	-2.5401	****	****
0.95	-1.9646	-0.3110	-0.1848

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-0.6033	0.6561	0.8232
0.15	-0.9441	0.4207	0.5757
0.30	-1.7497	-0.0812	0.2191
0.40	****	****	-0.0124
0.50	-1.6050	-0.2808	0.0615
0.70	-1.7449	-0.1409	0.0096
0.80	-1.7921	-0.2274	-0.0515
0.90	-1.6048	-0.1088	-0.0481

COLL = 28   RPM = 800   THRUST = 21.95
TORQUE =11.57   CT/S = 0.2249   CQ/S = 0.0593
PRESS = 14.698   TEMP = 69.69   DENSITY = 0.002317

Cpu

r/R x/c	0.125	0.20	0.30
0.06	-4.1638	-3.0005	-4.0094
0.15	-6.8906	-4.1002	-3.3658
0.25	-7.1342	-3.7814	-2.9491
0.35	-6.9172	-3.1735	-2.5874
0.45	-5.0519	-2.1139	-1.5684
0.55	-3.0353	-1.4315	-1.0451
0.65	-2.5589	-1.0488	-0.6977
0.75	-2.5522	-0.9083	-0.4995
0.85	-2.5267	-0.5624	-0.2236
0.95	-2.0378	-0.3819	-0.1686

Cpl

r/R x/c	0.125	0.20	0.30
0.10	-0.6173	0.5086	0.9218
0.15	-1.1484	0.2260	0.6659
0.30	-1.8168	-0.2043	0.2718
0.40	****	****	0.0037
0.50	-1.7791	-0.3530	0.0871
0.70	-1.6731	-0.2582	0.0207
0.80	-1.7635	-0.2882	-0.0408
0.90	-1.6578	-0.1950	-0.0472

COLL = 28   RPM = 1200   THRUST = 48.09
TORQUE = 24.96 CT/S = 0.2199   CQ/S = 0.0571
PRESS = 14.698 TEMP = 71.64   DENSITY = 0.002308

Cpu

x/c \ r/R	0.125	0.20	0.30	0.40
0.06	-3.7127	-2.8422	-3.5705	-3.6120
0.15	-6.7717	-3.8900	-2.9715	-2.7684
0.25	-7.4953	-3.8312	-2.5827	-2.1979
0.35	-7.0658	-3.2209	-2.1656	-1.6766
0.45	-4.7367	-2.2163	-1.5401	-1.1713
0.55	-3.2768	-1.4354	-1.0535	-0.7849
0.65	-2.7054	-1.0237	-0.7129	-0.5165
0.75	-2.6559	-0.8702	-0.5103	-0.3842
0.85	-2.6621	-0.5739	-0.2726	-0.3057
0.95	-2.2721	-0.3683	-0.1318	-0.1877

x/c \ r/R	0.50	0.60	0.70	0.75
0.06	-3.3440	-2.7921	-2.5749	-2.6428
0.15	-2.3166	-2.1529	-1.8111	-1.8882
0.25	-1.8117	-1.6149	-1.2692	-1.3704
0.35	-1.3747	-1.1644	-1.0088	-1.1125
0.45	-0.9825	-0.8393	-0.8383	-0.8515
0.55	-0.7315	-0.6985	-0.7510	-0.7032
0.65	-0.5440	-0.6123	-0.6776	-0.6401
0.75	-0.4350	-0.5574	-0.6059	-0.5891
0.85	-0.3282	-0.5491	-0.5665	-0.5456
0.95	-0.1606	-0.4133	-0.4044	-0.3930

Cpl

x/c \ r/R	0.125	0.20	0.30	0.40
0.10	-0.6961	0.5495	0.6846	0.8205
0.15	-1.3917	0.2504	0.4586	0.6266
0.30	-2.0740	-0.2329	0.1681	0.3159
0.40	-2.1931	-0.4900	-0.0049	0.1963
0.50	-1.8871	-0.4027	0.0511	0.1754
0.70	-1.7243	-0.2487	0.0080	0.0571
0.80	-1.7850	-0.2884	-0.0387	-0.0051
0.90	-1.6322	-0.2458	-0.0232	-0.0595

x/c \ r/R	0.50	0.60	0.70	0.75
0.10	0.8155	0.7908	0.7283	0.6821
0.15	0.6521	0.6436	0.6270	0.5797
0.30	0.3435	0.4027	0.3947	0.3889
0.40	0.2365	0.2902	0.2778	0.2806
0.50	0.1997	0.2335	0.2066	0.2200
0.70	0.0985	0.0666	0.0498	0.0808
0.80	0.0353	-0.0246	-0.0193	0.0125
0.90	-0.0319	-0.1257	-0.1197	-0.0904

COLL = 28   RPM = 1800   THRUST = 104.54
TORQUE = 55.45   CT/S = 0.2127   CQ/S = 0.0564
PRESS = 14.698   TEMP = 72.46   DENSITY = 0.002305

Cpu

r/R x/c	0.125	0.20	0.30	0.40
0.06	-4.0794	-2.8000	-3.5236	-3.4463
0.15	-7.0607	-3.7458	-2.9627	-2.5918
0.25	-7.6109	-3.7252	-2.6024	-2.1083
0.35	-6.8385	-3.1140	-2.1677	-1.6152
0.45	-4.2914	-2.1465	-1.5702	-1.1262
0.55	-3.0586	-1.5371	-1.0891	-0.7674
0.65	-2.6137	-1.0615	-0.7381	-0.5130
0.75	-2.5453	-0.8649	-0.5350	-0.3879
0.85	-2.5633	-0.5953	-0.3170	-0.3198
0.95	-2.3023	-0.3565	-0.1234	-0.2093

r/R x/c	0.50	0.60	0.70	0.75
0.06	-2.9980	-2.7558	-2.5479	-2.6468
0.15	-2.2919	-2.0800	-1.7735	-1.7073
0.25	-1.7810	-1.5651	-1.2388	-1.1747
0.35	-1.3217	-1.1356	-0.9622	-0.9431
0.45	-0.9267	-0.8127	-0.7913	-0.7936
0.55	-0.7081	-0.6671	-0.7099	-0.7024
0.65	-0.5190	-0.5675	-0.6255	-0.6311
0.75	-0.4173	-0.4953	-0.5681	-0.5857
0.85	-0.3303	-0.4855	-0.5514	-0.5597
0.95	-0.1774	-0.3459	-0.3792	-0.3931

Cpl

r/R x/c	0.125	0.20	0.30	0.40
0.10	-0.4921	0.3706	0.6391	0.7552
0.15	-1.2742	0.1039	0.4063	0.5570
0.30	-1.8136	-0.2845	0.1163	0.2804
0.40	-2.0279	-0.4584	0.0134	0.1874
0.50	-1.9296	-0.3915	0.0210	0.1520
0.70	-1.5965	-0.2754	-0.0085	0.0521
0.80	-1.6601	-0.2803	-0.0378	0.0023
0.90	-1.6211	-0.2208	-0.0301	-0.0565

r/R x/c	0.50	0.60	0.70	0.75
0.10	0.7921	0.7698	0.7293	0.6991
0.15	0.6357	0.6297	0.6222	0.5958
0.30	0.3315	0.3917	0.3962	0.3992
0.40	0.2266	0.2885	0.2812	0.2923
0.50	0.1941	0.2305	0.2138	0.2352
0.70	0.0952	0.0764	0.0681	0.0926
0.80	0.0265	-0.0075	0.0012	0.0355
0.90	-0.0414	-0.0978	-0.0883	-0.0765

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A test of a small three-bladed model rotor, with geometry typical of that used on tilt-rotor aircraft, was conducted in the U.S. Army Aeroflightdynamics Directorate's anechoic hover chamber. The objectives of the test were to determine the hover performance of the rotor and investigate the pressure distributions on a blade operating at various collective pitch angles and tip speeds. This report presents the rotor performance data and blade surface pressures.

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